TRANSPORT AND URBAN DECONGESTION COMMITTEE

NAIROBI CITY COUNTY

FINAL REPORT, 1ST OCTOBER 2014

PRESENTED TO

HIS EXCELLENCY THE GOVERNOR,

CITY HALL P.O.BOX 30075-00100, TEL.020344194, web.www.nairobi.go.ke NAIROBI KENYA

DR.EVANS KIDERO

LETTER OF TRANSMITTAL

1st October 2014

H.E the Governor
Nairobi City County
P.O Box 30075-00100
NAIROBI.

Your Excellency,

We the members of the **Transport and Urban Decongestion Committee** do wish to submit our report to you.We were commissioned on 27th January 2014 and started working immediately. We were mandated by the Terms of Reference to collect public views on how to resolve traffic congestion within the County of Nairobi.

We began our work by interpreting the Terms of Reference, which informed the formation of three working committees. We then agreed that both qualitative and quantitative data would be collected through questionnaires, focus group discussions, in depth interviews as well as oral and written submissions. Thereafter we selected strategic areas to collect information from residents of all 17 sub-counties including areas within the Central Business District. Data collected from these sources was coded, entered, cleaned, analyzed and tabulated as presented in this Report. Of special consideration were discussions held with relevant organization, stakeholders and experts in the field.The committee drafted an interim report as per our mandate which was handed in to your Excellency on 17th June 2014.

On handing this interim report we continued to engage the different stakeholders including the County government, members of the transport committee within the County Assembly and members of the public at a stakeholders meeting among others, who critiqued the interim document and proposed amendments as well as offered additional information all of which have been included in the final Report. Of particular importance is the implementation strategy the committee has presented in matrices with clear actors and time lines as per the recommendations of the County Executive Committee.

We have attempted to clearly and accurately document presentations by members of the public and relevant stakeholders. In an attempt to remain faithful to their views, there are repetitions

that to us indicate consensus on issues important to respondents in respect to the causes, effects and possible solutions regarding congestion in Nairobi City County.

Your Excellency, we have the pleasure to present to you this Final Report and to sincerely thank you for the honour and privilege given to us to serve this great County of Nairobi.

Prof. Marion Mutugi, PhD, EBS
Chair, Transport and Urban Decongestion Committee.

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GOVERNOR'S STATEMENT

Nairobi City County has experienced one of the most rapid growths in urban centers. It is home to UNEP and over 100 multinational companies, it is the seat of national government and most dignitaries live and work in Nairobi; it also acts as a transit point to neighboring countries within the region. The combined effect of all these factors has increased congestion on county roads, the situation has exacerbated owing to the fact that citizens buy an average of 6000 vehicles per month and the northern by pass is not yet operational, a situation that has resulted in numerous costs and waste to our growing economy. Conservative estimates project that Nairobi City County loses 3 Million USD per day translating to approximately 90 Million USD per month.

Aware of the fact that the residents of Nairobi have to be involved in the process of developing a solution to this problem, I constituted the Transport and Urban Decongestion Committee and mandated them to collect views from the residents of this great county on how best to alleviate the congestion situation in our county. The Committee consists of experts from various sectors within the economy, who applied both their knowledge and skills to ensure that this process was astutely carried out.

My government promised to reduce congestion and enhance happiness. This is a commitment that is close to my heart and the TUDC recommendations will translate these hopes and aspirations into a reality for Nairobians of all walks of life.

Nairobi is strategically located; it is the business hub of the region and unless we take tangible steps to address the issue of perennial congestion the city may lose this special comparative advantage status to other regional cities. Indeed, Nairobi generates 60 % of the national wealth. This means that Nairobi has to inspire the youth and create more jobs for them. This noble objective is not realizable if we allow Nairobi to be choked by traffic congestion as is the situation now.

Congestion is a worldwide menace with major negative impact on any economy that promotes both environmental and noise pollution. In this regard, I appreciate the fact that the problem of congestion is not an easy one to solve for it has taken more than five decades to build up to the current situation. I however believe that doing nothing now only leaves the problem for future generations to solve: where it may only be worse than it is now. This is a problem that requires hard choices to be made in order for congestion to be a thing of the past. Those tough choices need to be made by all actors directly affected by transport in Nairobi, for the greater good and in order for us to leave a legacy in Nairobi County for future generations to come. Nothing explains this better than the Chinese proverb which says; “Eat Bitter; Taste Sweet”. Little wonder, history has placed this heavy responsibility on my hands and it is my honesty believe that We must swallow the bitter pill now in order for this problem to be eradicated once and for all and for future generations to recognize that this was a turning point in the governance of Nairobi County and as an effective demonstration of the transformational leadership that Nairobians voted for. I am grateful that the TUDC has come up with creative and innovative approaches with holistic

and comprehensive perspectives that will address the overarching problem for the next generation.

I appeal to all Nairobi residents to read the proposals extensively and internalize them with a view to transforming their mindset in order for the implementation of these proposals to succeed. I am assuring the residents of Nairobi City County that this report will not become one of the statistics of the many studies, my government will implement all the recommendations to ensure that congestion is addressed in a comprehensive manner.

H.E. Dr. Evans Kidero
GovernorNairobi City County.

DEPUTY GOVERNOR'S STATEMENT

I take this opportunity to sincerely express my gratitude to H.E the Governor of Nairobi Dr. Evans Kidero for having a vision to transform the City to a world class good practice in traffic management.

The TUDC team demonstrated it can be done by adopting a grounded process to collect and collate views from members of the public which data they have analysed and come up with such a comprehensive report. I am well versed with his Excellency the governor's priority and thematic areas and I can assure Nairobi residents that the recommendations of the committee will be fully implemented.

Nairobi is one of the most visited cities South of Sahara and we thus want to ensure that those who visit or transit through the city shall do so with ease leaving them with positive and long lasting memories of the "City in the Sun". With the recommendations from TUDC we are certain that these will be the case.

I call upon all the stakeholders to give H.E. the Governor the requisite support to make this a reality.

H.E. Jonathan Mueke
Deputy Governor,
Nairobi City County

COUNTY SECRETARY'S STATEMENT

I am pleased to be associated with the TUDC team that H.E. the Governor commissioned for the express purpose of collecting views regarding decongesting our city. This team was so ably facilitated through the efforts of the County Executive Roads, Public Works and Transport Mr. Evans Ondieki and his office.

Although this was a monumental task, when I noticed the gusto with which the team approached the issue I was encouraged that the same was achievable. In this regard, I congratulate the members of TUDC under the leadership of Prof. Marion Mutugi who have diligently executed their mandate in spite of various challenges.

It is the privilege of my office to facilitate their work and wish to assure all that the recommendations set out in this report shall receive similar attention.

Ms. Lilian Ndegwa
County Secretary and Head of Public Service
Nairobi City County

FOREWORD

The release of the Transport and Urban Decongestion Committee's Report marks a great milestone for our county; for it provides a solution to the problem of traffic congestion that has plagued this county for many years with resultant waste and even greater losses. Though there have been many other suggested solutions, this one is unique for it has not been thought up in boardrooms by technical and government officers but rather it is from the public; you and me the Wanjikus, Kwambokas and Otienos of this County.

Nairobi County is the 14th largest city in Africa; it generates about 60% of the nation's wealth and has experienced one of the most rapid growths in urban centres at a rate of 100% and as of 2009 had a population of 3,138,369 living within a radius of 696 sq. km (269 sq. miles) and at the moment, the city is home to about six million inhabitants, during the day and the number reduces to five million in the night because almost one million residents from Kajiado, Kiambu, Muranga and Machakos Counties operate from their homes daily . It follows that the recommendations herein will have far reaching implications on neighbouring counties.

Nairobi County is home to thousands of Kenyan businesses and over 100 major international companies and organizations including the United Nations whose environment programme (UNEP) has a permanent home here. The Nairobi Securities Exchange is the fourth largest in Africa in terms of trading volumes and is capable of making 10 million trades a day. Nairobi is

the capital city of Kenya. The combined result of all these factors without commensurate infrastructural growth is increased congestion on County roads

It is against this background that H.E the Governor on 24th January 2014 commissioned the Transport and Urban Decongestion Committee to collect views from the county residents on how to address this situation in compliance with Article 10 as read with article 174 (c) of the Constitution that advocates for public participation in development of policy issues.

The members who consisted of professionals drawn from different sectors – transport, education, research, legal and business worked tirelessly to carry out their mandate by collecting views from the public during public forums organized in different sub-counties and presented findings in an interim-report handed to H.E the Governor on 17th June 2014. The document has formed the basis of numerous discussions including the county government, legislators and stakeholders. The Interim Report proposed numerous recommendations some of which are currently being implemented. These include;

i. Restricting the use of bodabodas within the Central Business District;
ii. Ensuring pedestrians comply with traffic rules and regulations;
iii. Reviewing existing stages within the Central Business District;
iv. Drafting legislation to set up a transport Authority and to help in the management of taxis within the CBD.

The County Government is pleased to now receive the Final Report and is determined and committed to implement the recommendations comprehensively with a view to decongest our

roads. It is in this spirit that we invite all stakeholders to join us in this noble venture to transform Nairobi City County in line with HE the governor's thematic areas.

Thank you

Mr.EvansOndieki
County Executive Committee Member
Roads, Public Works & Transport

STATEMENT FROM THE CHAIR

Transportation is the movement of goods and people from one location to another. It is however important to always remember that transport is primarily movement of people as well as goods and services for the people's benefit. In this respect, all approaches of traffic decongestion must, of necessity, target efficient modes of transporting people be it by air, rail, water, road, walkways amongst others.

Transport plays an important part in economic growth and good planning of transport is essential to make traffic flow. In this regard, urban transport can contribute to poverty reduction both indirectly through its impact on the city economy and directly through its impact on the daily needs of poor people.

There however is a fundamental paradox of urban transport that includes; How does a sector with an obvious excess demand over supply with heavy involvement of private suppliers fail to meet the aspirations of citizens; Why does economic development seem to have the effect of reducing the quality of travel for the poor; Why has it not been possible to mobilize commercial initiative to yield the kind of revolution in service quality and cost that has been achieved in other industries like telecommunication? These among others are the questions that the Transport

and Urban Decongestion Committee was commissioned to address through collecting public views.

As urban cities become richer, vehicle ownership grow more rapidly than the available road space, thus eating into public comfort; price of more accessible land increases, people are forced to live in less expensive land in inner city slums or city peripheries.

There are various options of addressing urban transport challenges in an urban setup. They include but not limited to; De-concentration – Shift activity away from mega cities, concentrating new development in medium size cities/satellite town; Coordinated land use and transport infrastructure and service planning; Good road infrastructure; Focus on non-motorized transport; Focus on mass rapid transit systems; Legal and institutional reforms among other interventions all of which are part of the recommendations made within this report.

I was honoured to be the chair of this committee and though the task laid before us was challenging it was a pleasure to be part of a team of individuals who were ready and willing to apply their expertise and time to ensure that this Report becomes a reality. The Report consists of results collated from a survey regarding the causes, effects and possible solutions to do with congestion in Nairobi City County. In addition is included a strategy to facilitate implementation.

Weas members of the committee note Nairobi City County has embarked on implementation of some of the recommendations contained in the Interim report and believe this will continue in respect to recommendation within this Final Report. We assure the people of this County that we shall continuously engage with the County to ensure they implement your recommendations. In this regard, we call upon members of the public to maintain pressure of the elected and appointed members of the County and hold them accountable for implementation of your recommendation for the good of the present and future residents of Nairobi.

Thank you and God bless you all.

Prof. Marion Mutugi, PhD, EBS
Chair, Transport and Urban Decongestion Committee.

DEFINITION OF TERMS

Boda boda:	pedal cycle or motor bike carrying paying passenger- pillion
Bus:	public transport vehicle carrying between 26 and 62 passengers
Constitution:	Supreme principle law that provides legal framework
Exchequer:	governmental department incharge of public revenue
Governor:	elected head of County government
Infrastructure:	basic physical and organizational structures needed for the operation of a society or enterprise
Matatus:	public transport carrying between 7 and 25 passengers
Metropolitan:	region consisting of a densely populated urban core and its less-populated surrounding territories.
Mini bus:	public transport carrying between 14- 25 passengers
Mkokoteni:	handcart
Public Hearing:	Seating where members of the public give facts related to public interest
Stage:	Designated place for pick up and dropping of public transport passengers
Technology:	making, modifying, usage, and knowledge of tools, machines, techniques, crafts, systems, and methods of organization, to solve a problem
Terminus:	Designated area for start and termination of public transport journeys
Traffic Congestion:	condition on transport networks characterized by slower speed, longer trip times and increased queuing
Transport:	device used to move an item from one location to another
Tuk tuk:	three wheeler motorized passenger carrying paying passengers
Urban Planning:	technical and political process concerned with the use of land and design of the urban environment
Vision 2030:	Kenya's development blue print up to be achieved by the year 2030

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LIST OF ABREVIATIONS

ADB:	African Development Bank
ANPR:	Automatic Number Plate Recognition
BRT:	Bus Rapid Transit
CBD:	Central business district
CCTV:	Closed Circuit Television
CCZ:	Congestion Charge Zone
CRP:	Compressed Road Pricing
COE:	Certificate of Entitlement
DTC:	Delhi Transport Corporation
ERP:	Electronic Road Pricing
ES:	Emergency Services
EU:	European Union
GOK:	Government of Kenya
GPO:	General Post Office
HOC:	Heavily Occupied Vehicle
ITMS:	Intelligent Traffic Management System
IU:	In-Vehicle Unit
JICA:	Japan International Corporation Agency
JKIA:	Jomo Kenyatta International Airport
JKUAT:	Jomo Kenyatta University of Agriculture and Technology
KARA:	Kenya Alliance of Resident Associations
KeNHA:	Kenya National Highways Authority
KeRRA:	Kenya Rural Roads Authority
KNH:	Kenyatta National Hospital
KPS:	Kenya Police Service
KR:	Kenya Railways

KRB:	Kenya Roads Board
KURA:	Kenya Urban Roads Authority
MOA:	Matatu Owners Association
MOLG:	Ministry of Local Government
MOPW&H:	Ministry of Public Works and Housing
MRPW:	Ministry Road and Public Works
MRTS:	Mass Rapid Transit System
MRTS:	Mass Rapid Transport System
MWA:	Matatu welfare Association
NCC:	Nairobi City County
NMPSU:	Nairobi Metropolitan PSV SACCOS Union
NMT:	Non- Motorized Transport
NMTA:	National Metropolitan Transport Authority
NTSA:	National Transport and Safety Authority
NUIMP:	Nairobi Urban Integrated Master Plan
NUTRIP:	Nairobi Urban Transportation Improvement Project
PPP:	Public Private Partnership
PSV:	Passengers Service Vehicle
SACCOS:	Savings and Credit Cooperative Societies
SIDA:	Swedish International Development Agency
SPV:	Special Purpose Vehicles
TLB:	Transport Levy Board
TMP:	Traffic Management Plan
UN:	United Nations
UNEP:	United Nations Environmental Programme
USD:	United States of America Dollar
WB:	World Bank
WHO:	World Health Organization

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MANDATE AND TERMS OF REFERENCE

Inarguably, Nairobi is the most important of all the 47 Counties in Kenya. Other than the fact that with 9% it is the largest in terms of population, houses the Capital Cityandreceives the largest allocation of devolved funds it is the economic hub that generates 20% of the country's GDP, the highest revenue to the exchequer(UN Habitat 2011).In this regard, the economic, social and political development of Kenya as envisaged in the country's blueprint, Vision 2030 is closely linked to that of the City of Nairobi. Thus, any impediment to economic growth in Nairobi will certainly impact the growth of the country as a whole.

Acknowledging traffic congestion in Nairobi City is untenable and commensurate loss of productivity is not conducive to achievement of the economic stimulus required to support achievement of Vision 2030, the Nairobi County Government committed to reform the transport sector.

Further recognizing thattraffic management is one of the devolved functions of the County Government under the fourth schedule of the Constitution of Kenya 2010, and in exercise of the power conferred on him by the Constitution, read together with the County Governments Act of 2012, the Governor of Nairobi City County constituted the Transport and Urban Decongestion Committee to collect public views on the existing transport system and recommendations on suitable alternatives that will create a reliable transport system and stimulate economic growth in Nairobi (annexure 1).

In Gazette Notice No. 720 published in the Kenya Gazette Volume CXVI- No. 18 of 7th February 2014 H. E Governor Evans Kidero gazetted a ten member committee to conduct asurvey that would provide opportunity for public participation in regard to the matter at hand as envisaged by the Constitution. According to the terms of reference, the committee was mandated to collect the views of Nairobians regarding but not limited to opinion on how to;

a) Formulate policy on:
    I. Change the attitude and behavior of drivers, touts, passengers, pedestrians;
    II. Pedestrian crossing that will seek to encourage pedestrians to use both foot bridges and Zebra crossings;
b) Formulate and develop a Transport Policy for Nairobi City County;
c) Prepare a quick wins programme of minor improvements to improve traffic based on the current and future traffic and identifying key priority intervention measures;
d) Collaborate with the University of Nairobi and JKUAT through Prof. Waiganjo to share knowledge and data from the institution on the issue;
e) Explore the existing stages and realign them by designating or re-designating them to the right place;
f) Carry out route by route verification and validation of the illegal stages and or recommend the way forward;
g) Identity key interventions (measures) that require to be put in place to improve traffic flow.

h) Develop recommendations that will address current and projected traffic congestion, access delays and NMT infrastructure;

i) Engage and collaborate with civic groups and resident Associations to appreciate the challenges facing the transport sector from the community's perspective; and to

j) Explore the operationalization of the Urban Mobility Study for Nairobi by Mot McDonald a consultant from the European Union.

The committee was inaugurated on 27th January, 2014 and was required to develop and regulate its procedures (annexure 2). It operated within the ambit of the County Executive Committee Member Roads, Public Works & Transport Hon. Evans Ondieki whose office provided the secretariat support. The chief officer Roads, Public Works & Transport Eng. Christine Ogut and her team provided the technical and logistical backing.

The membership of the committee consisted of members with various expertises and representing various stakeholders in respect to the task at hand.

- **Prof. Marion Mutugi**EBS, the chair is a research scientist with training and extensive experience in surveys and community engagement.
- **Mark Ngatia**, MCIArb the Vice chair is an advocate with extensive local and international knowledge on legal, statutory and regulatory frameworks.
- **Dr. Joyce Simitu** is a business woman in the transport sector based in the city and has training and experience in strategic management and business administration.
- **Anne Nicklin** is a business woman with wide cross cultural experience and institutional memory of the City.

- **Francis M. Munyambu** MBS OGW SS DCP the head of Inspectorate at the Nairobi City County has vast experience in security and law enforcement.
- **Henry Ochieng** a program director at the Kenya Association of Resident Associations which represents interests, of residents, consumers and taxpayers' rights countrywide
- **Tony Karimi** a businessman in the city and Chairman of the Nairobi Taxi Cab Association representing the interests of Taxis operating in the county.
- **Dickson Mbugua** a retired Banker is a director at the Kenya Urban Roads Authority and National Chairman of Matatu Welfare Association.
- **Barnabas O. Maroko** represented the interests of the Nairobi Metropolitan PSV SACCOS Union and co-operative societies in the public service vehicles.
- **Simon Kimutai** Chairman of the Matatu Owners Association represented the public service sector particular the proprietors of private owned public service vehicles.

A technical support team consisted of:

Joint Secretariat

- **Eng. Christine Ogut**, -Nairobi City County Chief officer in charge of Roads, Public Works & Transport.
- **James M. Ng'ang'a** - In charge of transport at the Nairobi City County
- **Eng. George Adongo Ruoth**–Consultant in energy and infrastructure

Secretariat Assistants

- Tom Tinega
- Makena Kaburu
- Zakia Kauma
- Agnes Akal
- Josephine Kithu

ACKNOWLEDGMENT

The Committee wishes to acknowledge the support of all those who provided information and support in making the work of the taskforce possible. These are but not limited to Mr Edward Ireri Mugambi who analyzed the data, Karuga Koinange who developed the cover page of the report. In addition GAUFF consultants, the Officer in Charge of Traffic in Nairobi County, National Traffic Police Commandant, EngMeshackOchieng, MrKamwengu, Prof.Waiganjo and DrOrwa others who took time to present their expert views on the matter. In addition is KARAwho convened a stakeholder forum to provide necessary critique as well as the Sectoral Committee for Transport and Public Works of the County Assembly and the County Executive Committee in Nairobi City County who gave insightful feedback on the interim report and have informed this Final Report. Last but not least are the CECM Mr. Evans Ondieki and his officers who provided all the support required for the work of the committee and H.E. the Governor Dr Evans Kidero whose insight provided the vision and leadership required for the committee's work.

EXECUTIVE SUMMARY

Traffic congestion is a common characteristic of urban areas which have increased population without commensurate infrastructural growth. A common but simplistic approach is that of reducing traffic flow by either increasing road capacity (supply), or by reducing traffic (demand). Increased supply usually involves the standard knee jerk reaction of expanding road space which includes widening an existing road by additional lanes, adding a new road, bridge or tunnel. Such road infrastructural redesigning may provide short term solutions with major benefits. In this respect arealso other supply-side approaches of junctions and roundabouts by grade separation provided by bridges or tunnels that free vehicles from stopping at intersections. Local-express lanes, providing through lanes that bypass junctions as well as separate lanes such as bus lanes for specific high occupancy vehicles are also approaches in this direction. A radical infrastructural approach is reversible lanes, where sections of a highway operate in the opposite direction on different times of the day or days of the week according to demand. These pose a potential for collisions, if drivers do not notice the change in direction indicators. Decongestion however cannot be achieved by mere increase in road networks for there are many factors that influence traffic flow demanding a multi-pronged approach.

Road space rationing, is a short term demand-side approach where regulatory restrictions prevent certain types of vehicles from driving under certain circumstances or in certain areas. In this respect are number plate restrictions based on days of the week, as practiced in Athens, Mexico

City, Manila and São Paulo. A weakness of this method is that the rich can purchase a second or third car to circumvent the ban at the same time increasing the number of vehicles.

Medium term approaches for decongestion include further supply-side approaches of investment in mass rapid transport systems (MRTS) be they high occupancy buses, trams, light rail or metro. This is accompanied by transit-oriented development where residential and commercial areas are designed to maximize access to public transport by providing a transit station or stop to these MRTS.

Demand-side approaches are parking restrictions, making motor vehicle use less attractive by increasing the monetary and non-monetary costs of parking. This is based on the argument that free parking distorts the market in favor of car travel, exacerbating congestion. This does not only discourage private transport but also provideand motivate use of MRTS. Another medium term approach is the demand-sideapproach of road pricing policy. Thiswas effected in London in 2003 and Stockholm in 2006 with decongestion success as well as remunerative benefits. Road pricing, provides for charging money for access onto a road/specific area at certain times, congestion levels or for certain road users. This guarantees that the number of cars does not exceed road capacity while avoiding the negative effects of shortages normally associated with quotas. However, since demand for cars tends to be inelastic, the result of such as strategy are exorbitant purchase prices for the licenses, pricing out the lower levels of society, as seen in Singapore's Certificate of Entitlement scheme. In economics of supply and demand, elasticity is the measurement of how responsive a variable is to a change in another. In the case of

Singapore, inelasticity is observed when demand for cars is not responsive to decreased road capacity.

Congestion pricing, is another medium term demand-side approach where a certain area, such as the inner part of a congested city, is surrounded with a cordon into which entry with a car requires payment. The cordon may be a physical boundary (toll stations) or it may be virtual, with enforcement being via spot checks or cameras on the entry routes. Singapore's electronic road pricing, London's congestion charge system, Stockholm's congestion tax are examples.

A long term approach involves urban planning and design that can have a huge impact on levels of future traffic congestion. In this regard, are grid plans including fused grid road network geometry, rather than tree-like network topology which branches into cul-de-sacswhich reduce local traffic, but increase total distances driven and discourage walking by reducing connectivity. Grid road networks avoid concentration of traffic in a small number of arterial roads and encourage trips to be made without a car. Furthermore, zoning laws that encourage mixed-use developmentdo not only reduce distances between residential, commercial, retail, and recreational destinations but also encourage cycling and walking. A radical long term approach is car free cities, car-light cities, and eco-cities designed to eliminate the need to travel by car for most inhabitants. A demand-side example of this long term approach is the proposed complete ban on motor vehicles in the Paris city's inner districts, with exemptions only for residents, businesses, and the disabled.

This survey noted that the traffic congestion challenges in Nairobi are basically as a result of past poor planning and implementation of plans for increased population and vehicles. The views of over 3000 Nairobians were sort regarding the causes, effects and possible solutions of congestion in their city. They readily and enthusiastically gave their views and recommendations not just for quick wins that would alleviate the current traffic situation but also futuristic ones in consideration of the Nairobi of tomorrow. Their views are not only consistent with professional views recorded in various reports on the same subject by experts since 1973 but are also similar to those used to decongest many cities worldwide.

In summary, Nairobians said that they were spending unnecessary and unacceptable long periods of time in the "largest parking lot" of the country sequestered in vehicles while wasting time that would otherwise be productively utilized. To reduce this frustration, they suggested a control of vehicle access into the CBD through development of an efficient, safe and reliable mass rapid transport system. With this system available, private motorists would be encouraged to park and ride from termini at the periphery of the city where also matatus and minibuses would terminate. Most of the respondents were concerned with indiscipline of road users and acknowledged the need for corruption free systems of stiff penalties fortraffic violations.

A report is only as good as its implementation. Recognizing that there are other reports that gather dust in shelves, if this also is the fate of this report, the people who spent time giving their views, county resources used and committee members' efforts will have been in vain. In this unfortunate possibility, future generations will harshly judge this first Nairobi City County government. It is however the hope and belief of this committee that the fate of this report will be different and recommendations will be implemented by the county government to decongest Nairobi. This will provide a legacy for all of us for generations to come**.**

INTRODUCTION

Transportation is the movement of people, animals and goods from one location to another using air, rail, road, walkways and water. This can be using motorized or non-motorized transport systems. Efficient transportation must of necessity focus on the movement of people. The field can be divided into infrastructure, vehicles and operations. Transport infrastructure consists of the fixed installations including roads, railways, airways, waterways, canals and pipelines and terminals such as airports, railway stations, bus stations, warehouses, trucking terminals, refueling depots (including fueling docks and fuel stations) and seaports. Terminals may be used both for interchange of passengers and cargo and for maintenance.Traffic congestion is a condition on road networks that occurs when the volume of traffic increases and is characterized by slower speeds, longer trip times and increased vehicle queuing. When traffic demand is great and road space is overfilled by users then the speed of the traffic decreases. In extreme traffic congestion, vehicles are stopped for long periods of time resulting intraffic jam or traffic snarl-up. Traffic congestion has become one of the major issues thatexert a negative influence on towns and cities in developing and developed countries worldwide.

The causes of traffic congestion are varied. Individual incidents such as accidents or even a single car braking heavily may cause a ripple effect which spreads out to create a traffic jam. However, despite various mathematical and economic theories and taking into account current population trends, traffic research still cannot fully predict under which conditions a "traffic jam" (as opposed to heavy, but smoothly flowing traffic) may suddenly occur. It is however clear that

the “tragedy of the commons” plays a role as conflict between individual interests and the common good are experienced.

Traffic congestion has negative effects.Economic losses due to fuel wastage as well as wear and tear on vehicles result from idling in traffic and frequent acceleration and braking and lead to need for frequent repairs and replacements. Further, delays that result in late arrival for employment, meetings, and education, result in lost business, disciplinary action or other personal losses and even more importantly waste of productivity time and the resultant economic loss of opportunity time. There is also increased risk of collisions due to tight spacing and constant stopping. In addition, environmental effects of pollutionsuch as vehicular emissions with accompanying health risks that have been clearly documented. Furthermore, emotional and psychological effects of congestion are recognized with trauma that may result to road rage. Road rage which is described as extreme aggressive drivingor angry behavior by a driver of an automobile or other motoristsmay lead to irrational surges of anger and might include rude gestures, shouting, verbal insults, deliberately driving in an unsafe or threatening manner, making threats or full confrontations outside of the vehicle.It has been known to lead to altercations, assaults, and collisions resulting in injuries and even deaths. The AAA Foundation for Traffic Safety in the USA analyzed 10,037 police reports and newspaper stories on traffic accidents that led to violence and found that between 1990 and 1996 road rage contributed to 218 deaths and 12,610 injuries translating to about 2000 confrontations per year. The study found that

road rage incidents increased nearly 7 percent each year within that six-year period whereby there were longer commutes which had led to more people on the roads.

Traffic psychologists have identified the detrimental health effects of being stuck in traffic. Other than the obvious pollution, extreme road rage experienced in traffic jams is extremely dangerous to human health. The initial aggressive stimulation during road rage is harmful to the body, especially if experienced on a recurrent basis. Anger accompanied by release of stress hormones into the blood system places the body into a fight or flight situation. Once high levels of the flight hormone adrenaline are pumped into the blood stream, drivers become stressed, anxious, agitated and their hearts beat faster in preparation for action. Without the expected action, this is harmful to the heart and other vital functions of the body and is in the extreme, similar to driving *under the influence*. In this situation, drivers overestimate their own driving skills, believing other road users to be less adequate and tend to be reckless thereby taking unnecessary risks. This may further escalate into loss of concentration, underestimation of other road user positions, increased reaction time which may result into accidents that could be fatal to themselves or other road users.

Most of these untoward health effects of traffic congestion are transient however, recurrent experiences can lead to long term consequences such as cardiovascular and other organ dysfunction. In Table 1, is a compilation of various health and environmental effects of traffic

pollution emanating from congestion compiled from WHO and UNEP reports (WHO 2003, UNEP 2014).

Table 1 Health and environmental effects of traffic pollutants

Type of pollutant	Traffic source	Health effects	Environmental effects
Airborne particles	Diesel exhaust	Acidic gases and volatile hydrocarbons into lungs may be carcinogenic	Soiling of buildings, reduced visibility odor
Sulphur dioxide	Fossil fuels diesel exhaust	Bronchitis, bronchospasm in asthmatics Respiratory irritation	Main constituent of acid rain, damage to plant and aquatic life
Nitrogen oxide	Motor vehicles	Respiratory irritation	1/3 acidity of rainfall
carbon monoxide	Incomplete combustion	Reduced oxygen to blood headaches, impaired concentration, angina, arrhythmia cardiac arrest, retarded fetal growth	Oxidizes to carbon dioxide and contribution to greenhouse effect ,global warming
ozone –	Photochemical reaction between nitrogen oxides and hydrocarbons	Coughing, impaired lung function, eye nose and throat irritation, headaches, asthma and bronchitis attacks	Greenhouse gas, damages crops, trees, plastics, rubber and paints
benzene	Emissions and evaporated petrol engines in petrol stations and cars.	carcinogenic	
Heavy metals	Exhaust fumes, particles from wear and tear	Hypertension. cancer, child development	Soil water plants entry into the food chain

Among children who wake up early and arrive home late the effects of traffic may be manifest by reduced intelligence, increased depression, anxiety and attention problems similar to post traumatic stress disorder resulting in poor performance at school (Hotz, 2011).

There also are positive effects and benefits of traffic congestion. Congestion has the benefit of encouraging motorists to re-time their trips so that expensive road space is in full use for a greater number of hours per day. It has also been argued that traffic congestion is beneficial by reducing road speeds in cities, which could reduce the frequency and severity of road accidents.

A HISTORY OF NAIROBI

The earliest account of Nairobi's history dates back toBritish Colonial Government'sconstruction of the Uganda Railway which commenced in 1896. In 1899, the railway line reached a brackish swamp occupied by the pastoralistMaasai as well as the agriculturalistKikuyu peoples. Here the British and Indian workers stopped where a camp and supply depot was built. Unlike the hot and humid coast, the cool temperature was a welcome relief and also offered an escape from the man-eating lions of the Tsavo low lands. The area located at 1°16′S 36°48′E and situated about 1660 metres (5450 feet) above sea level, was cool, and well supplied with water. It was called *Ewaso Nai´beri* or *Enkare Nyorobi* meaning "a place of cool waters" in Maasai. However, the British unable to pronounce this coined their own corruption of the Maasai name calling it Nairobi.

The railway complex and the building around it rapidly expanded and urbanized and soon became the railway's headquarters. From 1899 to 1905 it served as a British provincial capital. The town was totally rebuilt in the early 1900s after an outbreak of plague and the subsequent burning down of the original town. The city expanded, supported by the growth in administrative functions and in tourism, initially in the form of British big game hunting. As the British colonialists explored the region, they began using Nairobi as their first stop prompting the colonial government to build several grand hotels in the city for British tourists and big game hunters.

With the completion of the railway line, Nairobi grew as the British moved their administrative headquarters from the hot and humid Mombasa to the cooler, swampy town thus making Nairobi the capital. In 1906, the city had a population of 10,512 and in 1919, it was declared a municipality with its boundary extended to include surrounding part-urban settlements.By 1907, Nairobi was a bustling commercial center and replaced Mombasa as capital of the British East Africa. The boundary was again extended in 1927 to cover 30 square miles (48.km^2).

In February 1926, E.A.T. Dutton passed through Nairobi on his way to Mount Kenya and seeing the progress and the ambitious plans the city was making, foresaw the challenge ahead and predicted:

> *Maybe one day Nairobi will be laid out with tarred roads, with avenues of flowering trees, flanked by noble buildings; with open spaces and stately squares; a cathedral worthy of faith and country; museums and galleries of art; theaters and public offices. And it is fair to say that the Government and the Municipality have already bravely tackled the problem and that a town-plan ambitious enough to turn Nairobi into a thing of beauty has been slowly worked out, and much has already been done. But until that plan has borne fruit, Nairobi must remain what she was then, a slatternly creature, unfit to queen it over so lovely a country. (*Dutton, 1929).

Between the years of 1920 and 1950, the number of white settlers within Nairobi rose from 9,000 to 80,000 and the settlement was granted city status to formally become the Nairobi City Council in 1954. By 1963, when Kenya attained independence from the colonial British, the City of Nairobi had a population of 350,000. The population as shown in Figure 1 gradually increased to the current3,138,295 within 696 km^2 as per the 2009 census and is currently the 14th largest city

in Africa(The World Fact book. 2009).There however are arguments that this figure is the night population of the City compared to about 4.5 million day population that includes people working but not residing in the City. Since its foundation in 1899, Nairobi has experienced one of the highest growth rates of any City in Africa and has developed to become the largest city in East Africa, despite being the youngest city in the region. With a growth rate of, 4.1% it is estimated that Nairobi's population will reach 5 million in 2025 (Kenya Central Bureau of Statistics 2009).

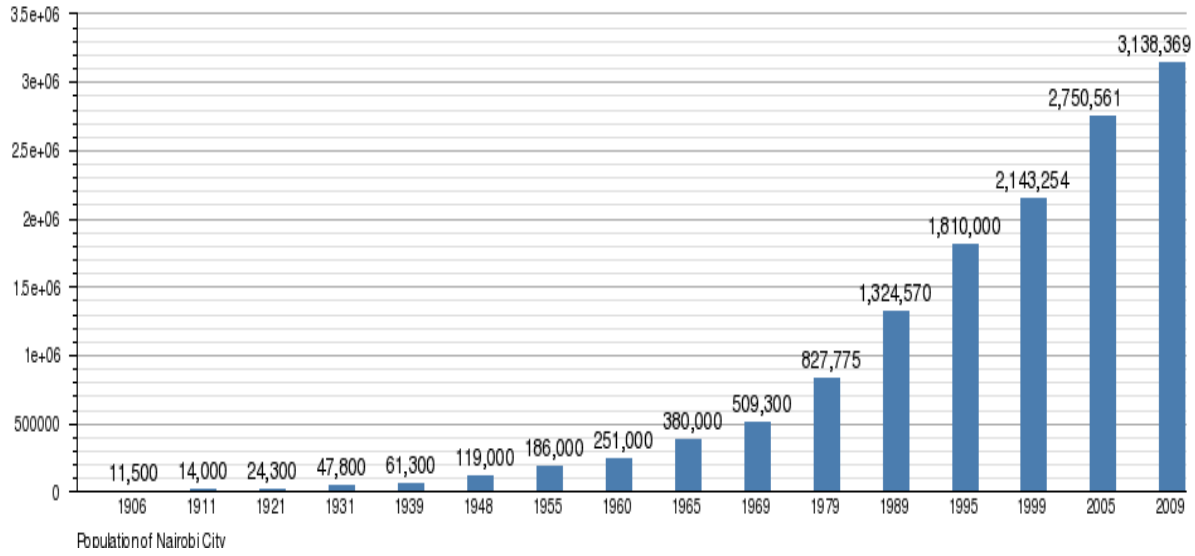


Fig 1 The Population of Nairobi between 1906 and 2009 (Various census)

The growth of Nairobi can be described as a typical urban sprawl where the natural expansion of the City has been haphazard with scattered development without commensurate infrastructure, public service provision and personal travel requirements.

TRAFFIC CONGESTION IN NAIROBI

The traffic congestion in Nairobi roads has reached unbearable levels. According to the 2012 IBM Commuter Pain Index, Nairobi residents have the fourth "most painful commute" in the world. The roads in Nairobi clutched in a gridlock have been described as the largest parking lot south of the Sahara and north of the Limpopo. Compared to clear roads, workers, business people as well as pupils and students take two or up to five times as much time to get to their desired destinations. Many have now developed strategies to mitigate traffic congestion with some forced to leave home as early as 5 am to get to their destinations on time. Commuters have also learned to depend on local FM radio stations that inform on the state of traffic on the roads before deciding what roads to use and when to commence their trips

The cause of this congestion in related to population growth. Nairobi's population has increased from 350,000 in 1963 to 3.3 million today with an estimated 300,000 vehicles without a corresponding increase of the road network. In 2007, a survey showed that 15.3% of commuters use private cars accounting for 36% of vehicles while 29% use Matatus constituting 27% of the vehicles on the roads. Another 47% of the city residents walk to their work places (Ministry of Roads and Public Works Report, Kenya 2007). These commuters enter the Central business district (CBD) through various corridors with Jogoo and Outer Ring roads having the highest traffic volumes of over 87,000 vehicles daily.

The majority of commuters get caught up in traffic jams every day, resulting in loss of man-hours and fuel as well as the resultant pollution that costs our economy an estimated Ksh 37 billion

annually (Jambo Nairobi). Without measures to improve the traffic situation, these losses are likely to increase drastically as the population of Nairobi increases to the projected 5.8 million by 2025, nearly double the current level, as predicted by UN Habitat (UN Habitat 2011).

Parking of vehicles in the CBD contributes to traffic congestion by reducing the road for vehicular movement as well as increased driving time while searching for parking slots. The CBD has about 9,000 parking slots on the street and car park lots operated by the County charging 300 per day. In addition are private parking lots which either charge daily or hourly rates. Shopping Malls also have parking bays with timed charging rates which serve short stay customers accessing their retail business. A few buildings have parking bays for their workers.

Assuming that there are 15,000 parking slots in Nairobi and 20% of the 300,000 vehicles require parking, then, four motorists would be competing for one slot; explaining why a search for parking can be a nightmare. According to an IBM survey in 2011, it takes motorists in Nairobi an average of 31.7 minutes against a global average of 19.8 minutes to find a vacant parking slot (IBM 2011).

It appears that other than increased vehicles in the city, parking slots have also decreased as land previously used as public car park has been disposed of and developed. Examples are behind Jamia Mosque, between Tubman Rd and Kigali Rd and also behind Central Bank of Kenya.

A paradox observed is between a need to increase vehicular movement on the road and decrease of parking space. Previous parking slots have been turned into no-parking zones and one-way streets while on other streets, angle parking zones have been changed to flash parking. These

changes though meant to reduce congestion by increasing usable road, have decreased parking slots, increasing time used in search for parking and with a net effect of increasing congestion.

Other than traffic decongestion, the revenue generation potential of parking is enormous. Nairobi had parking meters which were removed in the 1990s that charged a flat rate of Ksh 70 per day. This was increased to 140 in 2008 and further to 300 in February 2014. This parking charge is collected by County officers and enforced by clamping of vehicles. It is alleged that this system is regularly abused by parking attendants with only a fraction of the money getting to City Hall. Despite this official parking charges, there are informal charges of between KSh20 and KSh50 levied by parking street boys. Failure to complywith these unofficial levies, leads to motorists running the risk of breakage into cars or damage such as loss of side mirrors. This protection by parking boys theoretically guarantees the security of parked vehicles, since despite the parking charges, the County Government distances itself from this responsibility.

According to the County Governor Evans Kidero, traffic jams cost the City County approximately KSh 50 million daily in fuel consumption, manpower time wasted and cancelled business appointments. This is estimated to a loss of 37 billion shillings annually in terms of productivity, pollution and fuel. Traffic jams also have had an effect on business. Companies are now moving out of the CBD to less congested locations such as Upper Hill, Kilimani, Ngong road, Westlands and Gigiri, citing ease of access as the main reason for moving out. It is thus expected that with this trend of heavy traffic, there will be decreased demand and pricing in potentially prime areas in the CBD which have the highest concentration of new buildings. This

will discourage potential tenants as well push old ones out with devastating results for developers.

Over the years, there have been many studies and reports with recommendations relating to the traffic situation in Nairobi conducted from as early as 1973, ten years after independence. These studies commissioned by various government agencies and funded by varied development partners are listed in table 2.

Table 2 Previous studies and reports relating to Nairobi transport

No.	Title	Agencies/Donors	Year	Purposes	Relevance to the Study
1.	Nairobi Metropolitan Growth Strategy	Nairobi Urban Study Group/ City Council of Nairobi/United Nation	1973	Master plan for land use and transport for 2000	Present land use
2.1	The Nairobi Bypass Construction Project Feasibility Study	Ministry of Transport and Communications / JICA	February 1988	Feasibility study of Southern Bypass to divert through traffic on the A104 and traffic on the other roads to the Bypass and then to solve the traffic congestion in the main streets of Nairobi	Southern Bypass
2.2	The Nairobi Bypass Project, Detailed Design Study	Ministry of Transport and Communications/ JICA	September 1992		
3.	Actions Towards a Better Nairobi, Report And Recommendations of the Nairobi City Convention	Nairobi City Convention/ The Friedrich Naumann Foundation	1993	Plan of all sectors in Nairobi City for improvement	Missing Links etc.
4.	A Road Network Development Master Plan Study	MOPW&H/JICA	May 1995	Master plan for development of road network in Kenya in 2013	Southern Bypass
5.1	Kenya Urban Transport Infrastructure Project (KUTIP)	World Bank/ Ministry of Local Government	July 1996	[Staff Appraisal Report] Increase economic efficiency of the urban road network and build sustainable road maintenance	NMT

	(The project was suspended by World Bank.)			capacity for Nairobi and 25 urban centres and 22 secondary towns. Study for a long-term land use and traffic demand for Nairobi	
5.2	KUTIP Nairobi: Long Term Transport Study, Stage I	World Bank/ MOLG	January 1999	Master plan for urban transport in Nairobi under KUTIP (uncompleted)	
5.3.	KUTIP Final Engineering Report for Non-Motorized Transport (NMT) Works in Nairobi (under KUTIP)	MOLG/WB	November 2001	NMT study in Nairobi	
6.	Strategic Review; Kenya Road Sector	DFID/EU/KfW/SIDA/ WB	May 2002	Strategic review for road sector institution with KRB	Organisation
7.	Urban Mobility In Three Cities-Scoping Study: Addis Ababa, Dar es Salaam and Nairobi	World Bank	October 2002	[SSATP Woking Paper No.70] Comparing study for urban transport in three cities	Public Transport
8.	Assessment of the Non-Motorized Transport Program, Kenya and Tanzania	World Bank	Nov 2002	[SSATP Woking Paper No.71] Assessment of pilot projects of NMT undertaken in 1995 to 99 in Kenya and Tanzania	NMT
9.	Kenya Transport Sector Memorandum	World Bank, DFID, EU, KfW, SIDA	January 2003	Review of present transport sector for appropriate infrastructure strategy and policy direction	Organisation
10.	Road Sector Review and Stock Take Conference	Kenya Road Board	May 2003	Workshop report	Organisation
11.	Kenya Road Concession Framework	MRPW/World Bank BSK Group	November 2003	Concession study for northern corridor road construction including Southern Bypass	Southern Bypass
12.	Recommendations on Integrated National Transport Policy, Moving a Working	The National Transport Policy Committee, Ministry	February 2004	Transport policy	Transport Developmen t Policy

	Nation	of Transport and Communications			
13.	Kenya Transportation Policy and Roads Sub-Sector Policy and Strategy	KRB/ EDF, Scott Wilson	March 2004	Coordinating policy papers for GOK and donors To advance the process of policy and strategy formation and implementation for the road sub-sector in Kenya To summarise the core issues, describe the rationales behind the policies, the main requirements for implementation, and the assumptions	Transport Development Policy
14.	Northern Corridor Road Transport Improvement Project	Road Department MORPW&H/Ministry of Transport and Communications	April 2004	[Staff Appraisal Report] Increase efficiency of road sections in the Northern Corridor, Roadside amenities and HIV/AIDS Mitigation, Private sector participation in road management and maintenance, road safety improvement, institutional strengthening in the road sectors and TA	Southern Bypass
15.	Master plan Study Report for Urban Transport in the Nairobi Metropolitan Area	Ministry of Roads &Public Works/JICA	2006	Study to come up with a Master plan for Urban Transport.	Urban Transport
16.	Mass Rapid Transit study	Ministry of Transport/ADB.	2009	Study identified the nine corridors and the implementation schedule. BRT from Airport is under design by GOK; funding provided by world bank to implement project. NUTRIP.	BRT from the Airport
17.	PSV Demand Termini capacities and compliance level with TLB Regulations in Nairobi Metropolitan Area.	Ministry of Transport/TLB	2012	To identify the routes, their capacities and the compliance levels with the regulations.	PSV's.
18.	Harmonization Study by HB GAuff Ingenieure.	Ministry of Transport	2014.	In process of harmonizing MRTS along the Jogoo Road Corridor as well as the greater Nairobi	MRTS

				Metropolis.	

Recently, some implementation of short term strategies has started. According to Nairobi County Governor Evans Kidero;

> *"Everything is going in order and the integrated security and traffic control system will be one of many solutions toward addressing the city's traffic gridlock. The solution to solving traffic chaos lies in embracing technology as is the practice in developed countries."*

In this regard, are efforts of the County government to devolve and automate Nairobi City County services so that one need not to come to the County offices in the CBD. In addition, the recent introduction of newly trained traffic marshals and installation of closed-circuit television (CCTV) traffic cameras at junctions and intersections is meant to facilitate traffic flow and monitor compliance of traffic regulations for enforcement purposes. To date there are cameras at the Kenyatta Avenue and Uhuru Highway roundabouts, and also at the Westlands and University Way ones. According to the governor, the plan is to have more than 60 CCTV cameras installed throughout the city

The Governor further stated that:

> *We are not only introducing a system to manage traffic jams but also a smart technology to rein in notorious traffic offenders. Traffic cameras will capture car registration numbers of offending motorists and photograph their face and this will be relayed to a server room situated at the Nairobi County headquarters. Cameras will be live throughout the day and night and motorists should get familiar with the way the system operates to avoid being on the wrong side of the law.*

The Traffic cameras are also meant to reduce crime in the city by live video as well as data recording which will be put into use to reduce crime in the city. According to the Nairobi County Traffic Commander Edward Mwamburi, the new system would make the work of traffic police officers more efficient and easier. He said:

> *Unlike now when the only evidence of a traffic offence is a traffic police officer's word against the offending motorist, the new system has the capability to preserve evidence in digital format which we will use to punish offenders in court. Offending motorists will no longer be able to speed away before traffic officers can write down their number plates. That kind of impunity is coming to an end because the cameras are powerful enough to read number plates and facial figures of the driver.*

In addition, the completion of the Northern, Southern and Eastern by passes will ease traffic as transit vehicles with no business in town avoid the CBD. This will provide medium term decongestion relief.

In early August 2012, the World Bank released some $300m to top up the Kenyan government's $113m to finance Nairobi Urban Transportation Improvement Project (NUTRIP) and completely overhaul Nairobi's transport utilities by 2015. This would include construction, upgrading, expansion and operation of new rail and rapid bus transport systems as well as planned upgrade of Uhuru Highway with a 12km elevated road from the Likoni Road Junction on Mombasa road to James Gichuru Junction off Waiyaki Way in Westlands. Other than removing transit vehicles from street level, this elevated road will segregate traffic from Thika superhighway at Museum hill to Uhuru highway on to Mombasa road in the East and Waiyaki way to the west. There are proposed overpasses to South 'B' and 'C' Estates as well as Langata Road/ Lusaka Road. This is

a long term decongestion strategy which has been dogged with controversy over procurement and is still in the pipeline.

In respect to MRTS, a commuter rail system to Syokimau/Imara Daima/Makadara stations to the Nairobi Central Railway station in the CBD has commenced with park and ride facilities. This service is to be expanded to link the CBD to the Jomo Kenyatta International Airport (JKIA), Ruai, Kiambu, Kikuyu, Kiserian, Limuru, Lukenya and Thika suburbs. There also is a long term program for creating MRTS through a network of light rails and truncated buses. These transport systems are set to be coordinated and regulated by the proposed transport authority.

Commenting on this mass commuter system, Johannes Zutt, World Bank Country Director for Kenya said;

> *By helping to ease traffic congestion and develop a modern commuter system, this project will enable Nairobi to remain a great city in which to live and to do business. Developing countries like Colombia, Mexico and Nigeria have embraced mass public transit systems as they transitioned to middle-income status, and it is now time for Kenya to follow their example."*

Emanating from all these studies are recommendations that are planned but not commenced such as:

- Increase in Uni-Direction (one-way) traffic movement, along: Moi Avenue, Koinange Street, Tom Mboya Street, Muindi Mbingu Street, Harambee Avenue, River Road, Kirinyaga Road, City Hall Way and Parliament Road.
- create dedicated bus routes and lanes in the central business district

- Remove on-street parking from Moi Avenue, Tom Mboya Street, Muindi Mbingu Street, Koinange Street, Harambee Avenue, River Road, Kirinyaga Road and Haile Selassie Avenue.
- Increase parking by multistory car parks, at sunken car park next to Aga Khan Walk, the Law courts car park, Hakati car park and Central bus station.
- Designate drop off and pick up points on Haile Selassie Avenue at Agip petrol station, Wakulima market area, Railways terminus and St. Peter Clavers – kaka; Moi Avenue between Moi Primary and Jevanjee Gardens as well as Kencom; Kenyatta Avenue at Simmers Hotel and Hughes Building.
- Create Park and Ride stations to service Thika Road, Mombasa Road, Ngong Road and Waiyaki Way
- Reinforce road reserves on all by pass and ring roads
- Restrict heavy transit traffic between 07:00-10:00 and 16:00-20:00 on weekdays
- Allow vehicles with over 60 passengers and standing passengers to use roads within CBD
- Expand the Central Business District to include Westlands, Pangani, Eastleigh into Jogoo Road, Lusaka Road into Nairobi West, Langata Road, Mbagathi into Hurlingham

In summary, most of the studies regarding the traffic situation in Nairobi were detailed and had relevant recommendations. However, their full implementation was hampered by a lack of clear funding mechanisms. This occasioned delays that have resulted in the studies becoming obsolete and not responsive to the changes in regard to development, land use and population, thus resulting in the current state of increasing congestion and need for update studies.

In addition, the dynamic nature of governance structures resulting from re-organizations has resulted to a disconnect in respect to information available between the various government agencies and a lack of clear duty bearers in respect to implementation. This has necessitated the

HB GAuff Ingenieure study to harmonize reports from previous studies. It is however evident that without timely implementation, more harmonization tasks might be necessary as the various variables in the city development, population and land use changes.

METHODOLOGY

At the beginning of the task, thematic sub-committees were set up which provided weekly reports to the main committee. These were the demographic, regulators and organizations, public Hearings, Data handling, procedures and literature review committees. Each sub-committee had a chair and consisted of members from both the committee and the technical members facilitated by the secretariat.

The public was made aware of the presence of the committee and invited to participate in the public hearings as well as present oral, written or electronic submissions. This was in compliance of the Constitutional requirement stated in Article 174(c) where one of the objects of devolution is

> *to give powers of self-governance to the people and enhance the participation of the people in the exercise of the powers of the State and in making decisions affecting them*

Media approaches included setting up a link on the Nairobi City County Website that provided the mandate and role of the Committee as well as ways, means and venues of submission of views. Using electronic media, there were various TV and radio appearances by members of the committee on the week starting 24th February 2014. On 26th February 2014 Mr. Maroko and Mr. Munyambu on Radio Maisha, Prof Mutugi and Mr. Mbugua on K24 and Mr. Karimi and Mr. Ngatia on Capital Fm.

Using a print media strategy, a newspaper advertisement was placed in the Saturday Nation of 8thMarch 2014 to inform the public on the dates and venues of the public hearings; posters placed

at strategic positions in the City such bus/matatu termini and stages, lamp posts as well as 20,000 fliers were distributed throughout the city using the public transport operators (annexure 3). In addition, banners were hung across different highways such as Waiyaki way, Mombasa, Juja and Thika and Jogoo roads as well as venues where public hearings were held.

Furthermore, letters were delivered to all the county, constituency and ward representatives informing them of the activities of the committee and inviting their participation. Similar invitations to the various associations, organizations and authorities were also dispatched.

Nairobians presented their views by filling in questionnaires, participating in focus group discussions and in depth interviews as well as presentation of written submissions. The public hearings were heldin 27 sittings in various venues for 12 days as listed in table 3.

Table 3 Venues and dates of the public hearings of the traffic decongestion committee

No	VENUE	DATE
1.	NPC- Lang'ata South	9th March 2014
2.	Amani Centre next to surveyors of Kenya, Thika Road	10th March 2014
3.	Kaptagat Hall (Kangemi) Kasarani Sports View	11th March 2014
4.	Ridgeways City Hall	12th March 2014
5.	City Cabanas City Hall Visa Oshwal Centre	13th March 2014
6.	Kariobangi Social Hall City Hall	14th March 2014

7.	Ridgeways Baptist Church Ngara Gardens King Assembly Church	16th March 2014
8.	Railwaysbus terminus City Hall	17th March 2014
9.	Jericho Social Hall City Hall Railway Terminus KENCOM Stage Tom Mboya statue Ambassador Stage	18th March 2014
10.	Kariokor Social Hall KENCOM Stage Gigiri Java Cafe Tom Mboya Statue	19th March 2014
11.	St. Andrews Church	23rd March 2014
12.	Galleria Shopping Mall	29th March 2014

The survey collected both quantitative and qualitative data using questionnaires, focus group discussions and in depth interviews. The questionnaire availed either in English or Kiswahili consisted of 35 questions the first five of which captured demographic characteristics of the respondent and the other views on traffic congestion. The majority of the questions were closed where the respondents chose from a number of options provided. There however were a few open questions where a respondent's opinion was sought. The questionnaire was mostly self-administered although where there were difficulties in literacy, it was administered by a member of the committee. A copy of the questionnaire is in annexure 4.

Focus group discussions were used to collect data on the causes, effects and possible solutions of the traffic congestion from various sittings. Furthermore, using the guide in annexure5,in depth interviews were conductedwith various identified interest groups such as:

a) Matatu Owners Association (MOA);
b) Matatu Welfare Association (MWA);
c) Kenya Urban Roads Authority (KURA);
d) Kenya Rural Roads Authority (KeRRA);
e) Kenya National Highways Authority (KeNHA);
f) Kenya Roads Board;
g) National Transport & Safety Authority (NTSA);
h) Kenya Alliance of Resident Associations (KARA);
i) Kenya Railways;
j) Kenya Police Service;
k) Emergency Services;
l) Nairobi Metropolitan PSV SACCOs Union LTD;
m) Nairobi Central Business District Association;
n) United Business Association;
o) Eastleigh Business Association;
p) League of Persons with Disability; and
q) Scholars and professionals with expert views on the issue of decongestion.

Those who requested to give oral presentations or written submissions were availed the opportunity to electronically submit views through email and Facebook addresses and twitter handles as follows;trafficdecongestion@nairobi.go.ke, Nairobi City Traffic Decongestion; and NrbCity_Traffic as advertised.

The sampling design considered that Nairobi is a heterogeneous population with various strata. There were attempts to get representations from the various social demographic groups such as geographic areas (constituencies) and those who access the central business district through various roads. In this regard, the following road corridors were considered; Lang'ata, Mombasa, Ngong, Valley, Kiambu, Limuru, Outer ring, Jogoo, Juja roads; Waiyaki Way and Thika Super-Highway.

Furthermore, various stakeholders who use both motorized and non-motorized means of transport were also considered. Other strata were the population according to sex, age, and occupation, frequency of travel to the CBD as well as length of stay in the city.

Using a sample size of 2500 and a confidence level of α=0.02 at 98%, the precision error of the study was 0.02. Quantitative data from the questionnaires was entered, cleaned while qualitative data from the questionnaire, focus group discussions, in depth interview and various submissions was coded and entered. All data was thereafter analyzed to provide descriptive statistics, trends as well as relationshipswhich are presented in narrative, tables and figures.

RESULTS

The section captures the results of the survey from the various quantitative and quantitative data collection from oral, written or electronic submissions.

Public views from questionnaires

The survey captured the view of 2489 respondents who completed the questionnaires. These were from all 17 sub-counties of the Nairobi County

General observations

Most respondents were willing and enthusiastic in presenting their views and readily completed the questionnaires or gave oral and written submissions. However, there were some who were skeptical that the information they gave would be of no use in respect to implementation and decongestion of the City. Certain people actually said that they had previously given their views on the same subject but were yet to see any action. When they were however informed that the committee members were independent and not employees of the County, they seemed to be a little more confident in providing information and hopeful that this time something would come out of the exercise. Furthermore, the fact that this exercise was commissioned and would be implemented by the new devolved unit – the County as opposed to the City Council seemed to increase their confidence.

Interestingly the majority of people wanted to answer the English version of the questionnaire saying that compared to the Swahili version, they were more comfortable English. However, they preferred to converse and discuss the matter in Kiswahili. It took about 10 minutes for most

people to complete the questionnaire however, there were some people who required assistance which was readily given by a committee member and took a longer period of time.

Demographics

Regarding the people who responded and gave their views by filling out the questionnaires, about two thirds were 40 years old or less and more than half of all the respondents being youth under 35 years old (figure 2). This is proportionate and reflective of the demographics of the Kenyan population where there is a large youth population. People aged over 60 years were least represented in answering the questionnaire.

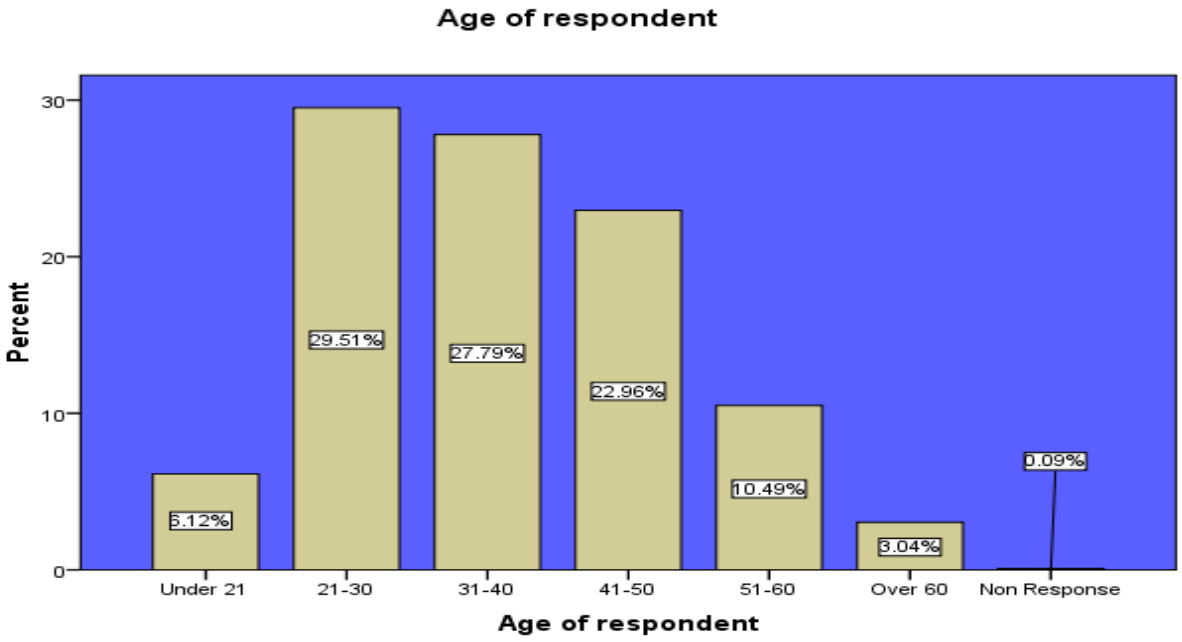


Fig 2 The Age Distribution of the Respondents

Almost three quarters (71.5%) of respondents who participated in filling the questionnaires were male with females being 28.5%. These results shows that females who constitute 51% of the population were under represented in this survey and could skew the data accordingly in favor of the male population. This gender disparity may have been due to socialization where female accessibility may have been compromised by household responsibilities. In this respect, males would be more likely to agree to spend time in filling the questionnaire.

As shown in Figure 3, 41% of respondents were employed constituting the largest group as per occupation. This was followed by business people (29%) and students (18%).

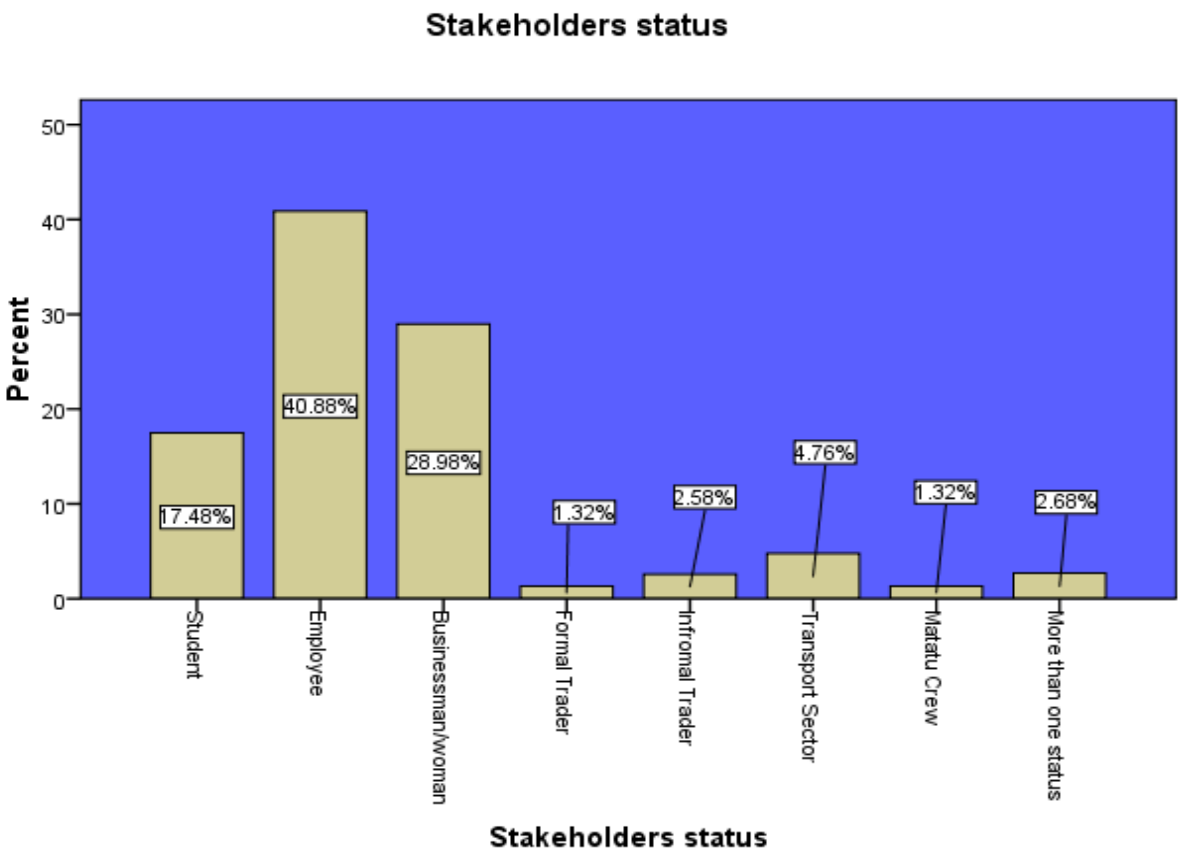


Fig 3 The Traffic stakeholder status of the respondents

A large proportion (17%) of the respondents reported that they did not live in the city. Of those who lived in the city, all the 17 subcounties were represented with Roysambu with the highest proportion of respondents at almost 9% followed by Westlands at 7% and Langata, Kasarani and Makadara at 6% respectively. These demographics represent the situation in Nairobi where there is a large population who work within the city but livein Peri urban areas beyond the City boundaries.

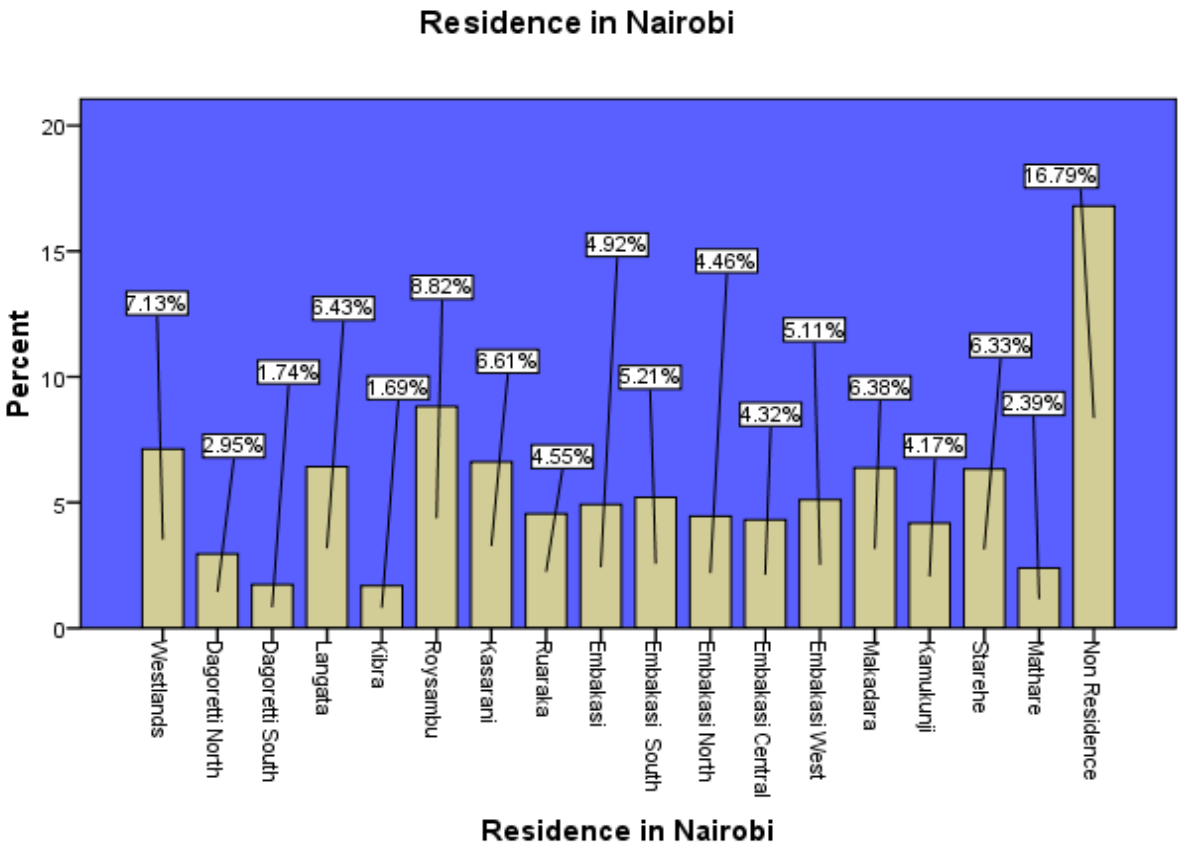


Fig 4 The residence of the respondents

Respondents' knowledge of the City

Of the total number of respondents, half had lived in Nairobi between five and twenty years with the largest proportion (20%) having lived there between five and ten years. Ten percent reported that they had lived in the city for less than five years while there were 8% who had lived in the city for over forty years many reporting that they had lived here all their lives. This shows that

most of the respondents had extensive experience in the goings on of the city and were most likely conversant with changes they had observed over the long periods of their stay in the city.

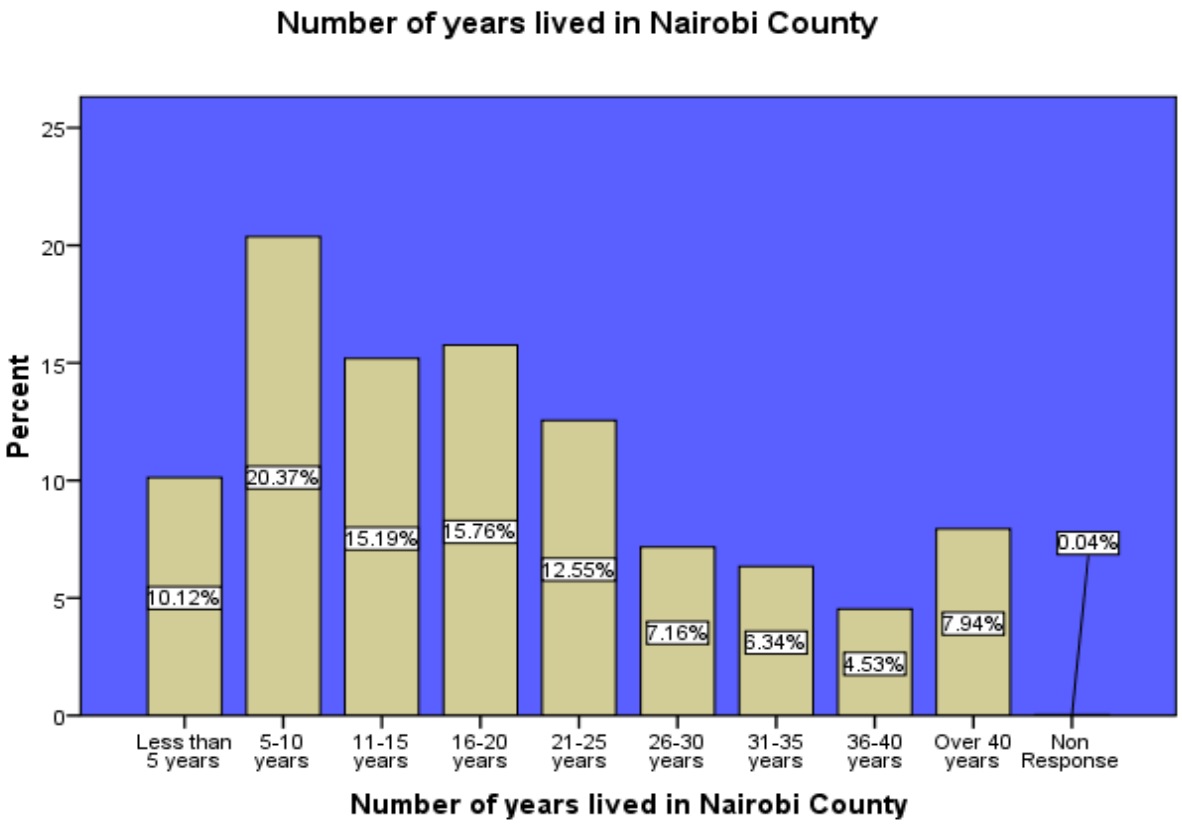


Fig 5 The number of years respondents resided in the City

Almost three quarters of the respondents come to the CBD five or more times a week. Of all respondents, 14% reported that they access the CBD more than once a day. Furthermore, 40% reported that they enter the business district six or seven times a week. This implies that the

respondents were conversant with traffic trends on different days of the week including week ends.

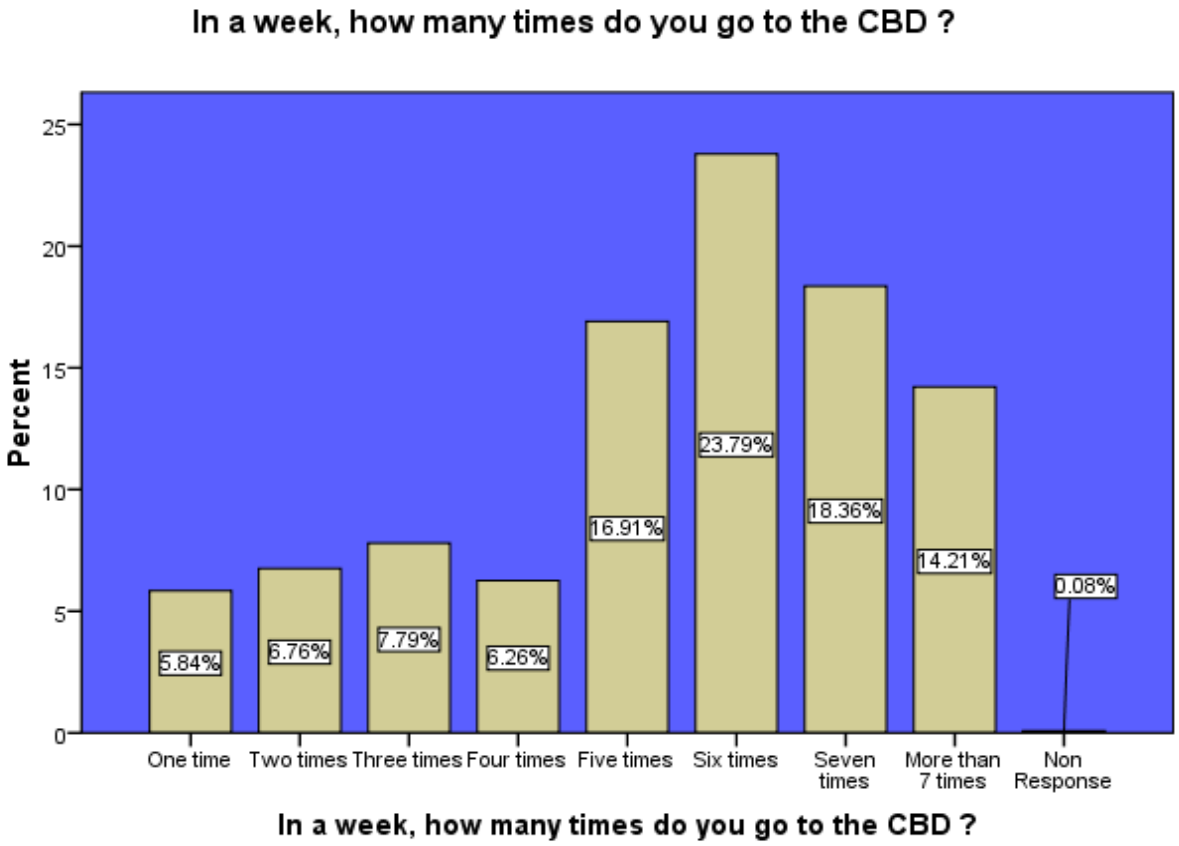


Fig 6 The frequency of respondents travel to the CBD

Access into the CBD

Two thirds of the respondents access the CBD using the privately-run public transport system; over half using Matatus and 14% by mini buses. Seventeen percent used private vehicles while 12% reported that they used either the public or private transport system. This 12% may explain the aggravated traffic jam situation at certain times such as rains, suggesting that private vehicles are used almost doubling the reported 17% when public transport is available.A meager 1% reported use of the rail while 4% walked to and from the CBD.

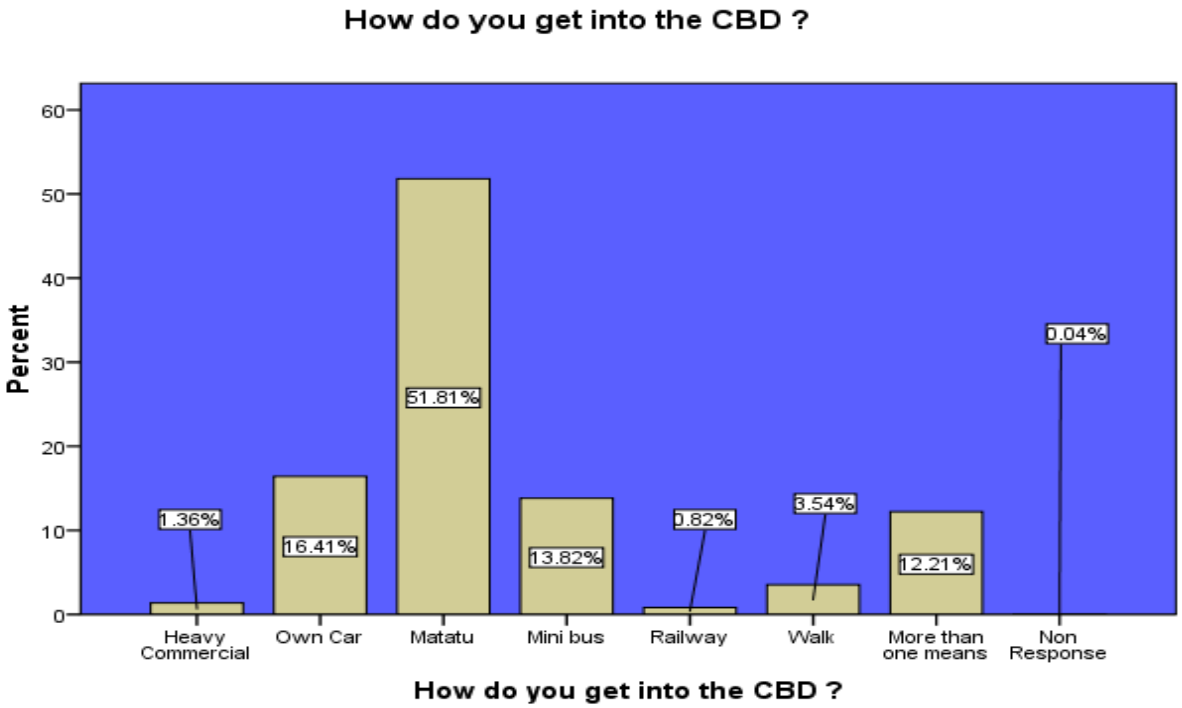


Fig 7 The mode of respondents travel to the CBD

The survey investigated roads through which respondents accessed the CBD and found out that Jogoo, Thika, Mombasa roads as well as Waiyaki way were the major entry routes. These are the four main corridors from the south, east, north, south and west into the city.

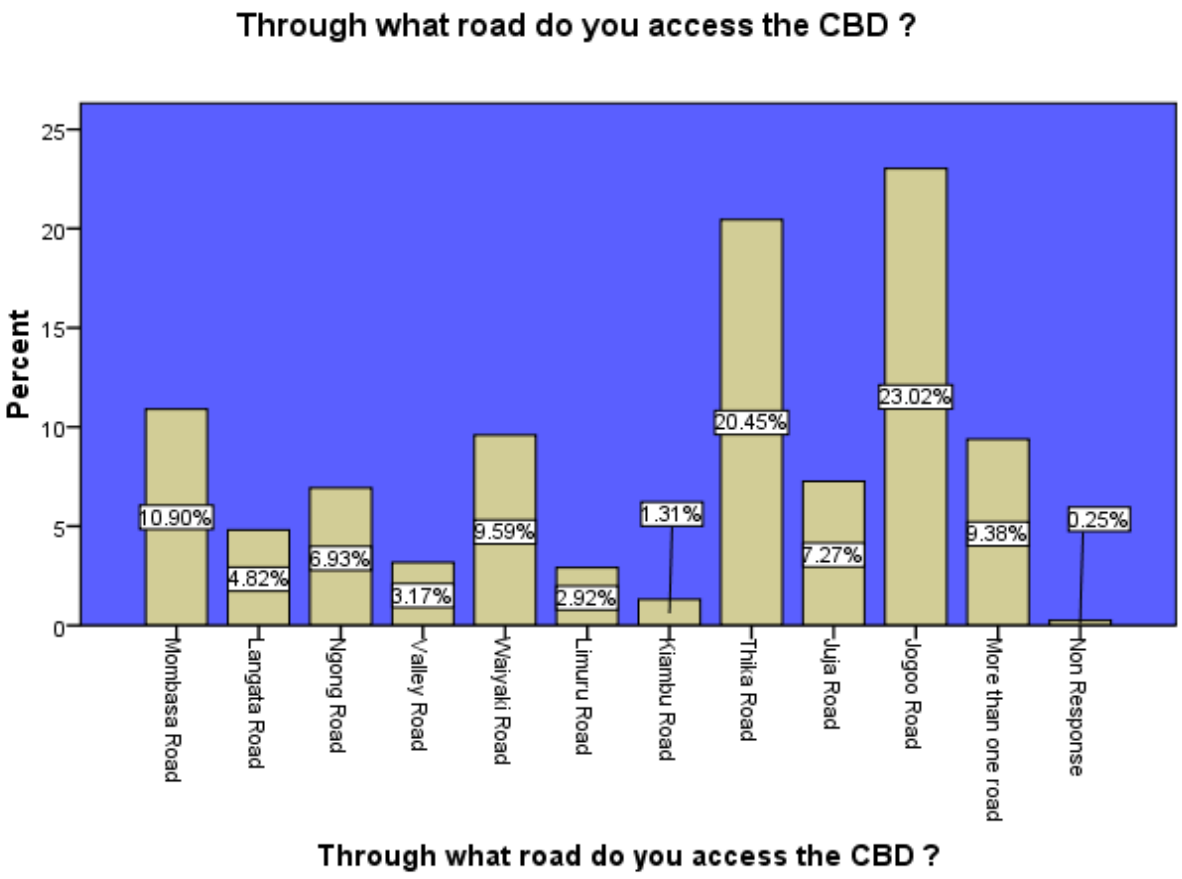


Fig 8 The corridor of respondents entry into the CBD

On enquiring the time taken to access the CBD, the highest proportion of the respondents (37%) said that it took them between half and one hour to get into the CBD on week days followed by a frequency of 25, 22 and 9% for a time period of one to one and a half hours, one and a half to

two hours and between two and two and half hours respectively. Only 6% reported that they took a period of less than 30 minutes to get to the CBD on week days.

On weekends and public holidays however, 56% were able to access the CBD within 30 minutes 31% between 30 minutes to one hour, 6% between an hour and one and a half hours, 4.5 % between an hour and a half and two hours only 2% between two and three hours. The people who reported to taking over three hours to access the CBD remained at about 1% irrespective of whether it was a work or non-working day.

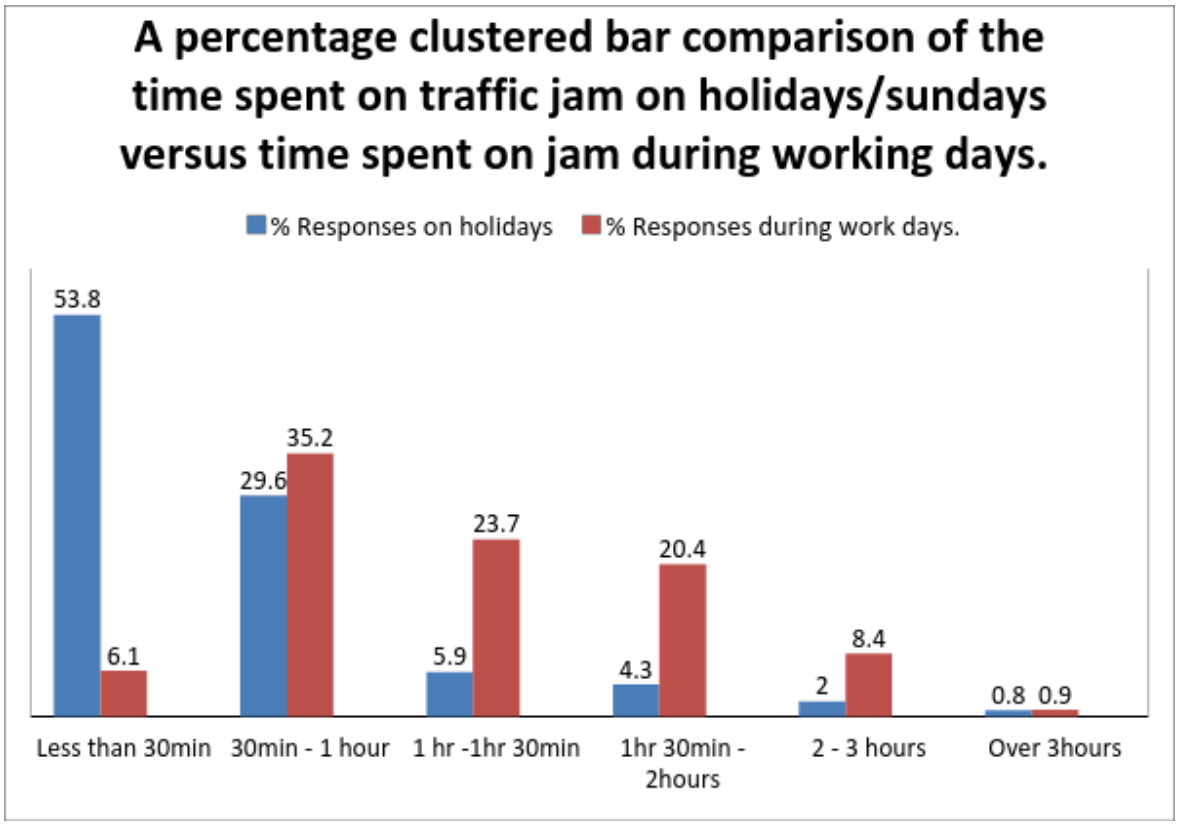


Fig 9 Respondents' time taken into CBD on working and non-working days

Ninety nine percent of all the respondents said that there was a traffic congestion problem in the City of Nairobi. On who among all road uses, respondents believed to bear responsibility in respect to traffic congestion, results showed thatvarious road users were considered to be most responsible by the following proportion of respondents; matatus (75%), private vehicles(71%), pedestrians (55%), minibuses (48%) , heavy commercial vehicles(46%) , mkokotenis (45%), and motor bikes(38%). Pedestrians, motorbikes and mini buses (18, 16, and 11% respectively) were considered to be least responsible of traffic congestion.

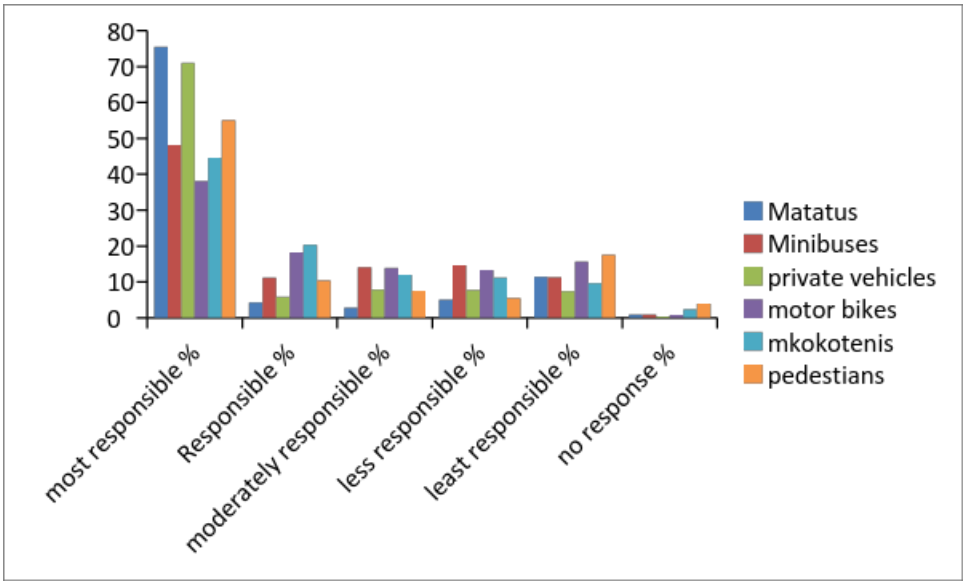


Fig 10Road users considered to bear varying degrees of congestion responsibility

Road discipline

Of all the people interviewed 77% reported that road users are not disciplined.On enquiry on specific road users and their discipline 33, 30 and 21% of the respondents cited personal cars,

matatus and heavy commercial vehicles as the least disciplined while the most disciplined road users also personal vehicles, heavy commercial vehicles and matatus (9, 7 and 6% respectively).

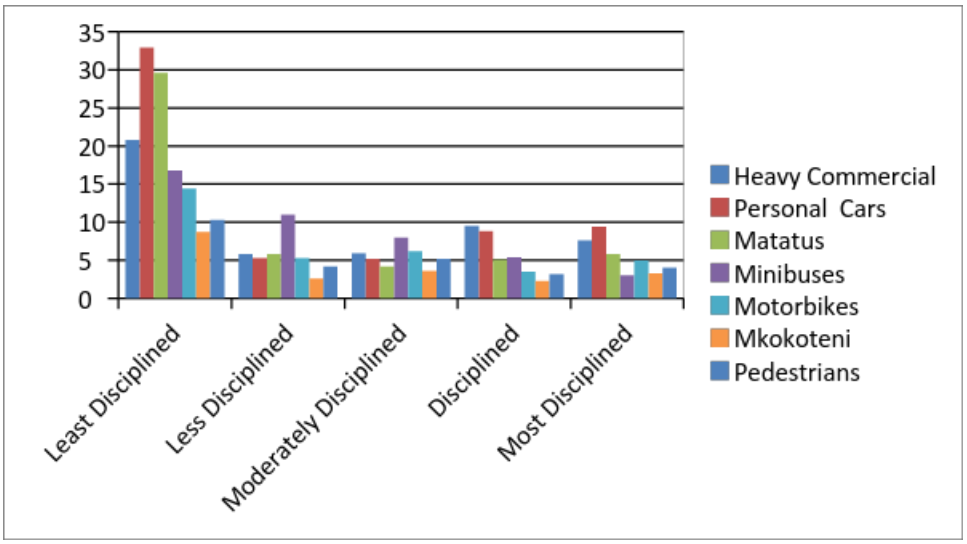


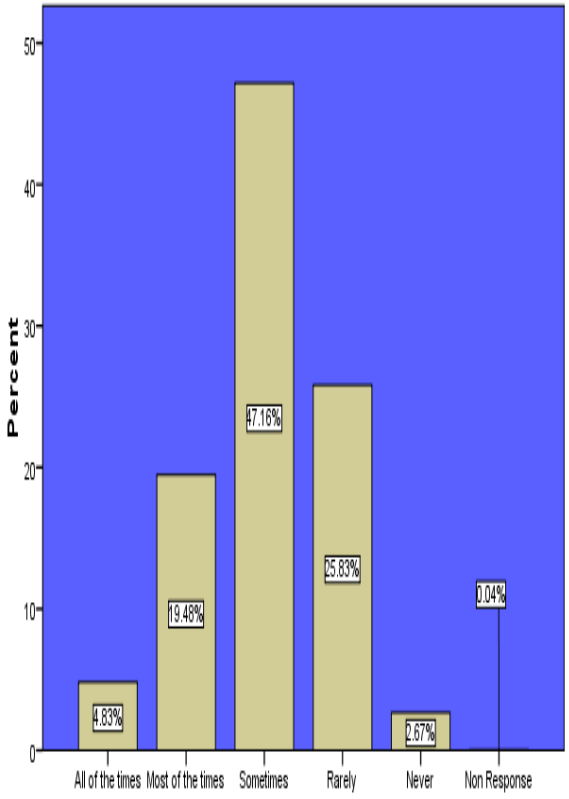
Fig 11 Road users considered to have varying degrees of discipline

Regarding pedestrians, only a quarter reported that where available, these road users utilize pedestrian (Zebra) crossing points all or most of the time. Furthermore, only 19% utilize available foot bridges all or most of the time. The highest frequency of response was about 50% as response that pedestrians "sometimes" use pedestrian and foot bridges. Overall, respondents reported that they believed that regular use of foot bridges was less than that of pedestrian crossing.

The most common reasons cited for not using the pedestrian crossings and foot bridges were ignorance of traffic regulations (26%), people being in a hurry and laziness (23%) and lack of road safety awareness (11%). Others reasons cited were that footbridges are not strategically placed; a "don't care" attitude; insecurity as well as hawkers and street family dens; lack of law

enforcement; dirt, human, waste and filth as well as an observation that Nairobians just prefer shortcuts.

Where available, do pedestrians use the pedestrian (Zebra) crossing ?



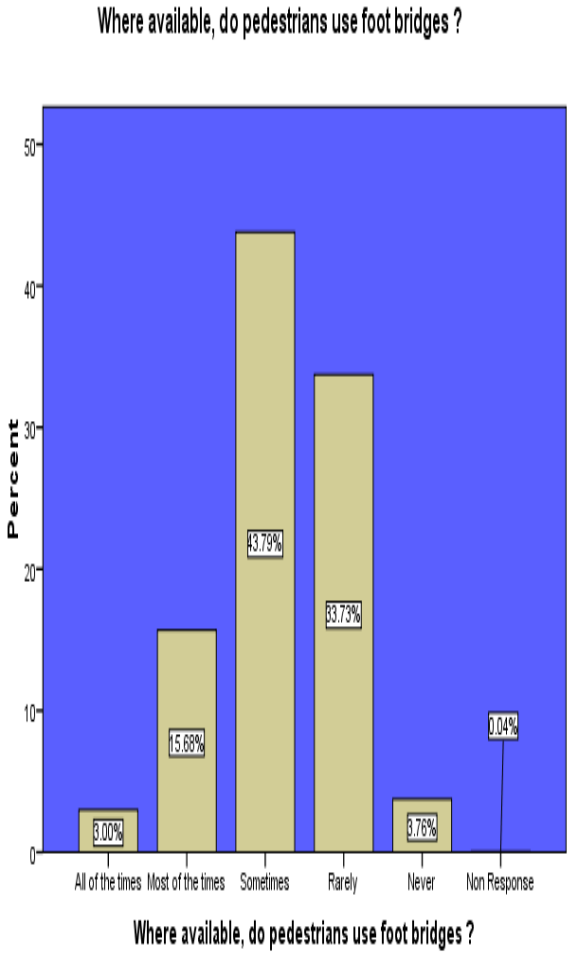


Fig 12 Pedestrian use of pedestrian (zebra) crossings and foot bridges

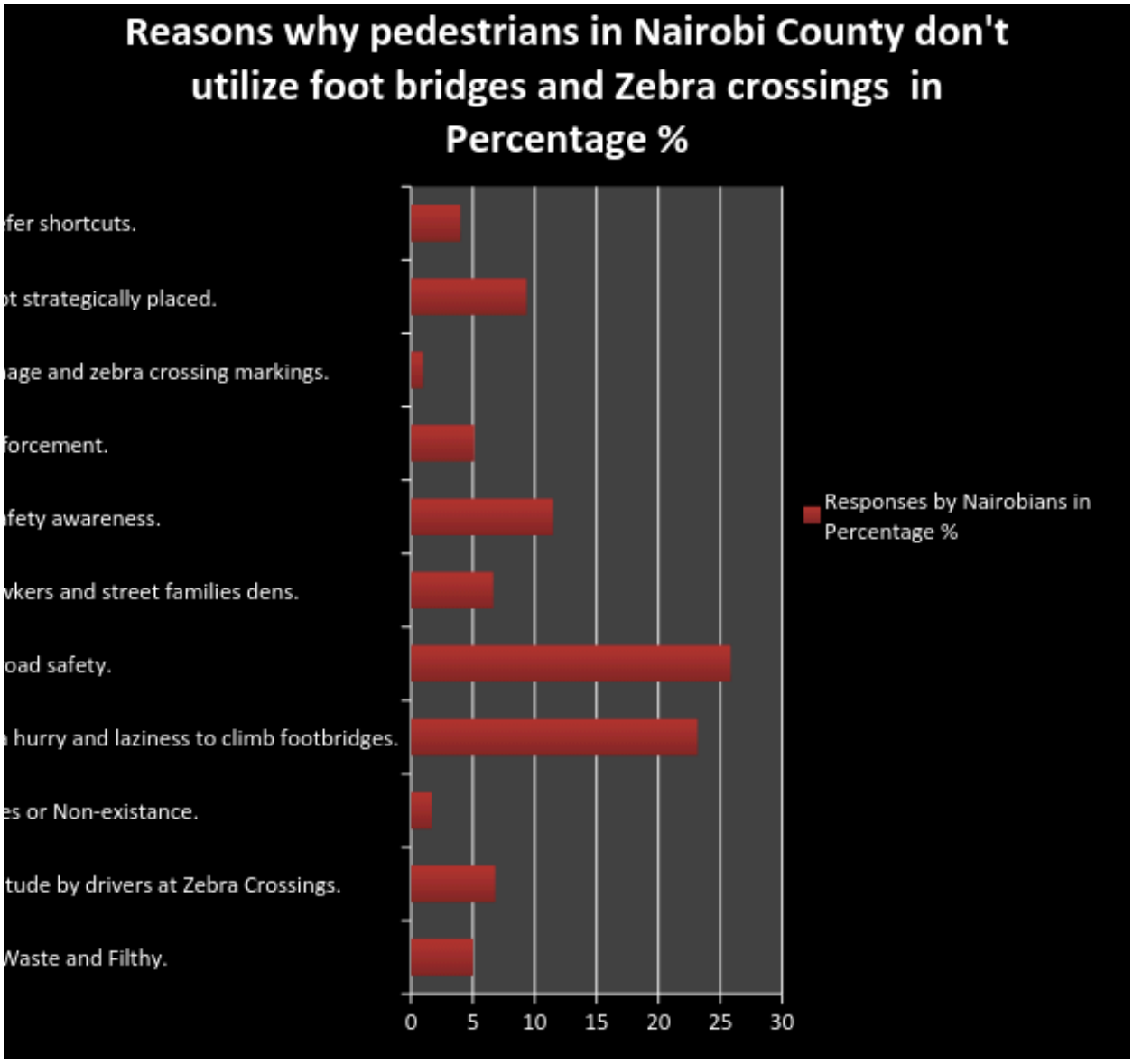


Fig 13 Pedestrians reasons for non-use of pedestrian Crossings and foot Bridges

In respect to motorists giving way to pedestrians, only 20% of the respondents said that this happened all or most of the time while 30% said that pedestrians were never or rarely given way

at crossings. It is interesting to note that a similar proportion of between 40-50% of respondents believe that the pedestrians utilize crossing crossings and foot bridges "*sometimes*" with a similar frequency for motorists giving way to pedestrians "*sometimes*".

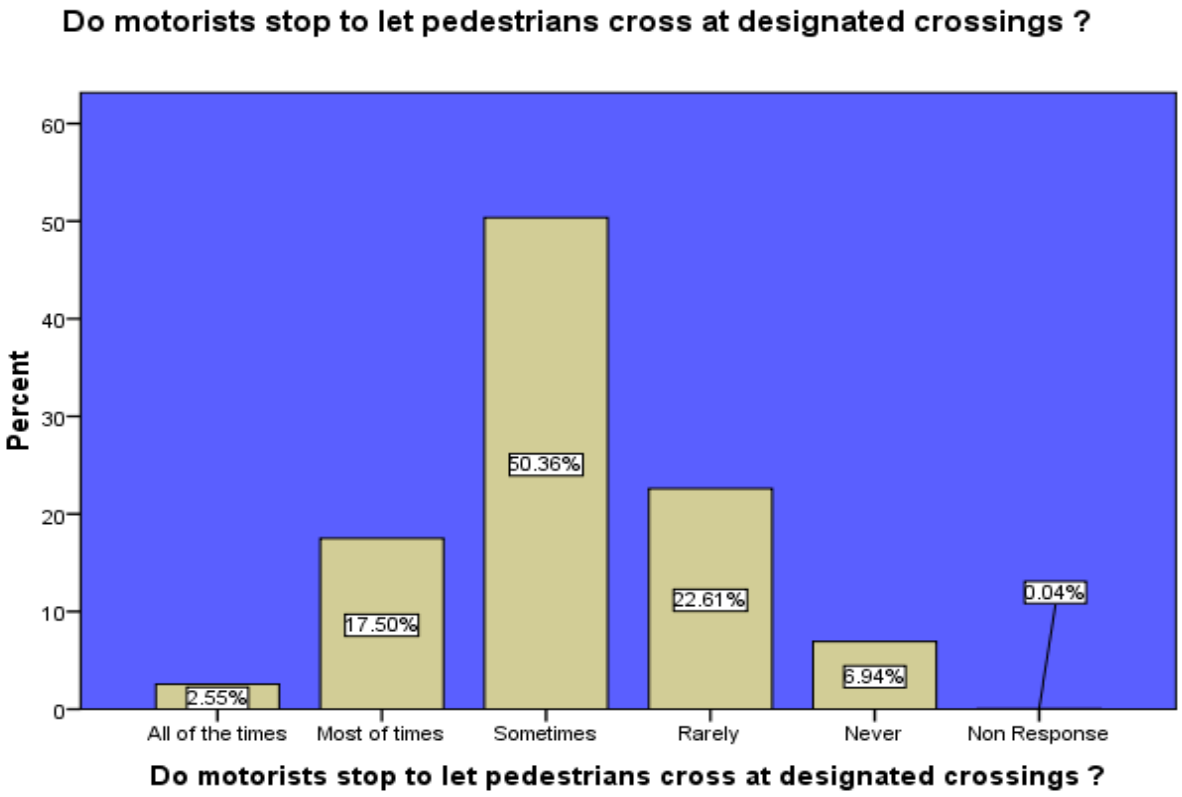


Fig 14Motorists giving way to pedestrians at designated crossings

Respondents were asked to give their views regarding public transport vehicle discipline in respect to picking and dropping of passengers at designated places. Over half of the respondents reported that the required discipline by public service vehicles was rare or never observed while

34% said that this discipline was observed sometimes. Only 10% said that they thought this discipline was observed all or most of the times.

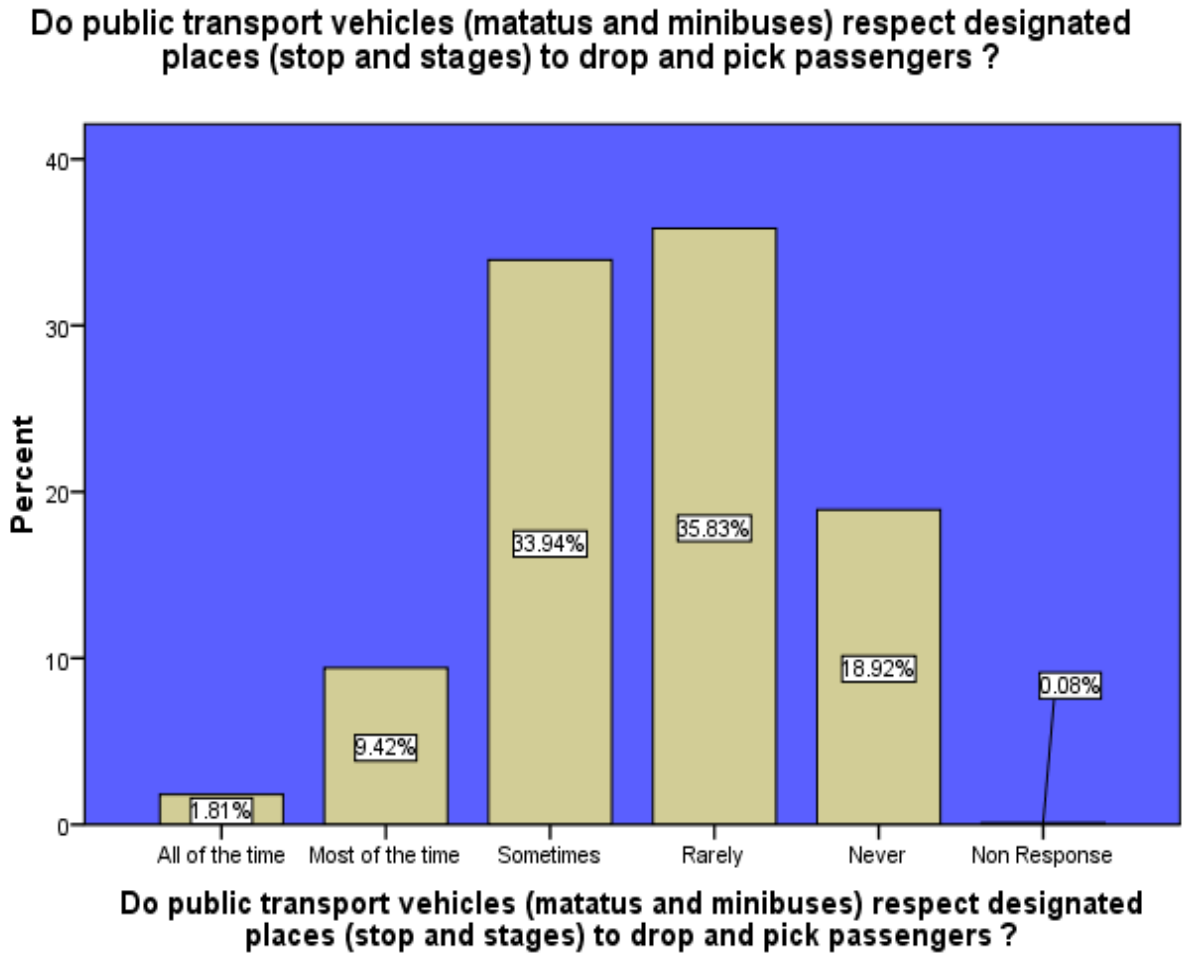


Fig 15 Public transport vehicle compliance to designated passenger drop and pick places

In respect to traffic lights, less than 25% reported that motorists obeyed them all or most of the time while half said that they only did this sometimes. However, they said that motorist obeyed traffic police or marshals all or most of the time (14 and 39% respectively). This suggests that Nairobians seem to respond to human traffic control more than electronictraffic control systems.

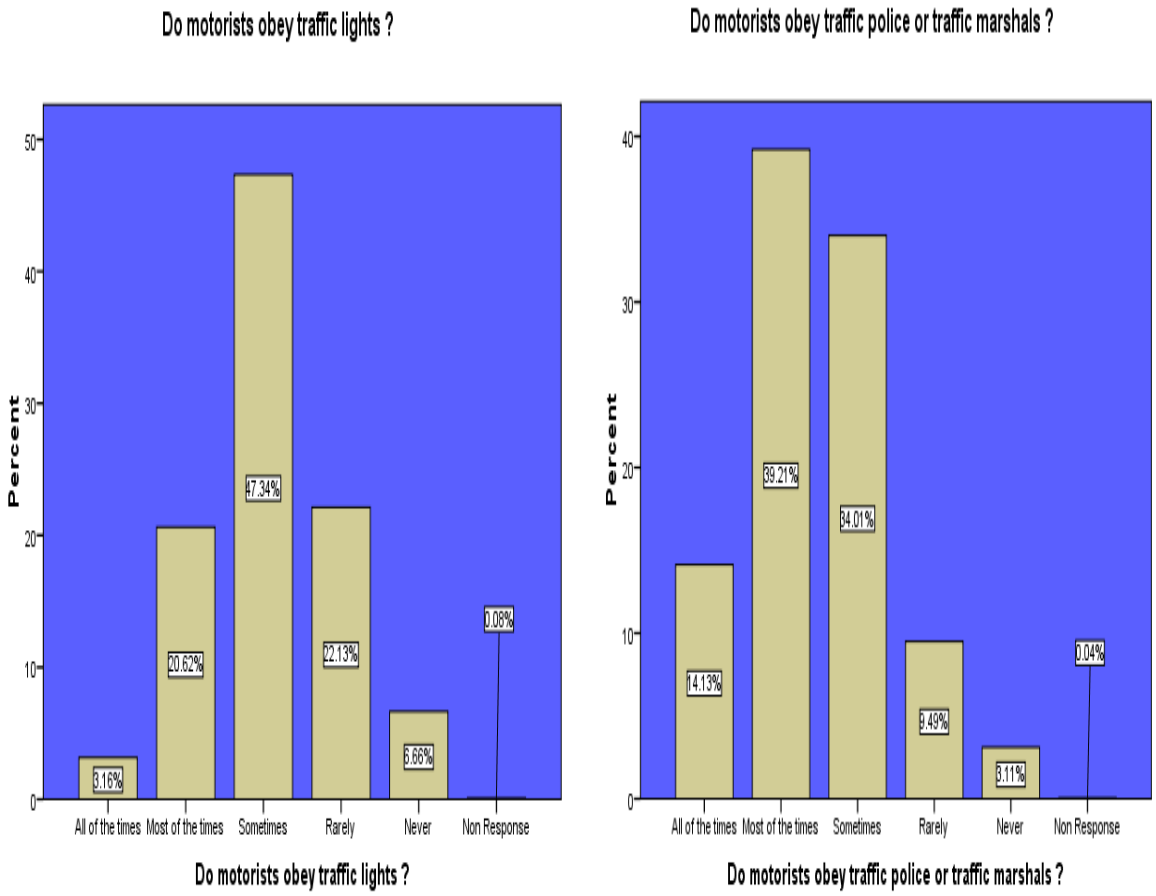
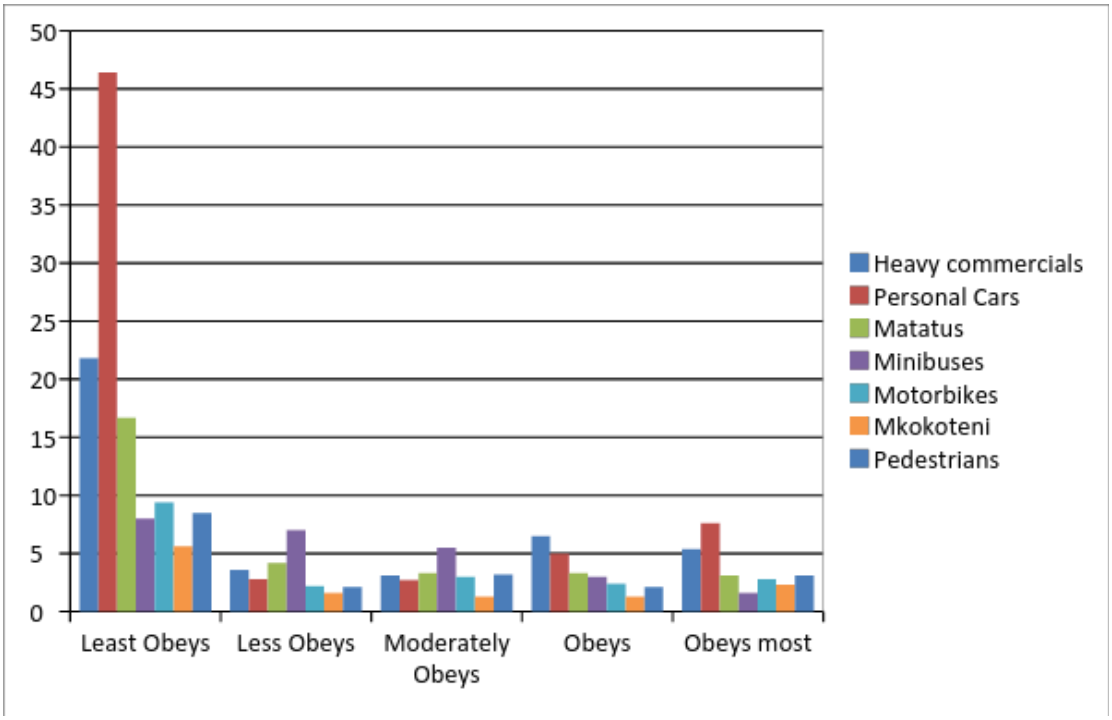


Fig 16 Motorists compliance to traffic lights, police and marshalls' commands

Respondents reported that of all road users,personal vehicles, heavy commercial vehicles and matatus in that order least (46, 22 and 16%) obeyed traffic lights. However, the same three groups of road users were reported to obey traffic lights most (7, 5 and 3%).



Of all road users who obeys traffic lights?

Fig 17 Road Users Varying Obedience to Traffic lights

The majority (86%) of respondents reported that they felt that police have a role in traffic congestion. On seeking to find out the specific role, many reported that the role was that of traffic control at junctions and roundabouts particularly during peak hours. However others felt that Traffic police contribute to congestion by allowing access without considering the traffic burden, not synchronizing with others as well as giving contradictory instructions with traffic lights.

Do Police have a role in traffic congestion?

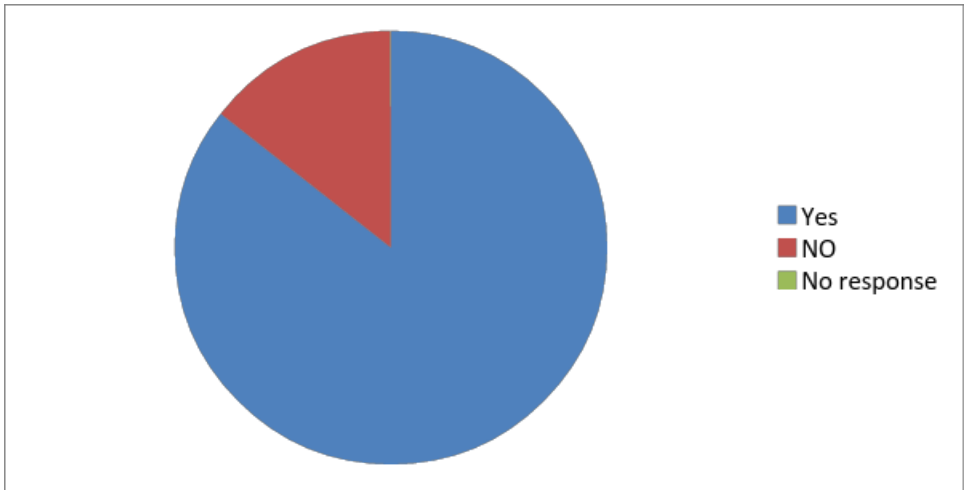


Fig 18 Respondents perception onpolice role in traffic congestion

The most common reasons cited for indiscipline was a lack of awarenes and ignorance of traffic rules (17.5%), closely followed by corruption and bribery of traffic policeby drivers (17%), arrogant drivers and conductors (11%) as well as week enforcement of traffic rules and a lack of heavy penalties (10%). Other reasons respondents thought caused indiscipline on the roads were impatience of drivers and passengers; disregard of traffic rules, overlapping and lack of respect for other road users; incompetent drivers, bogus driving licences and illiterate drivers; greed to make more money; a lack of proper road infrastructure, traffic lights and road signs; delays in traffic jams; alcoholism and drug abuse among drivers and impunity.

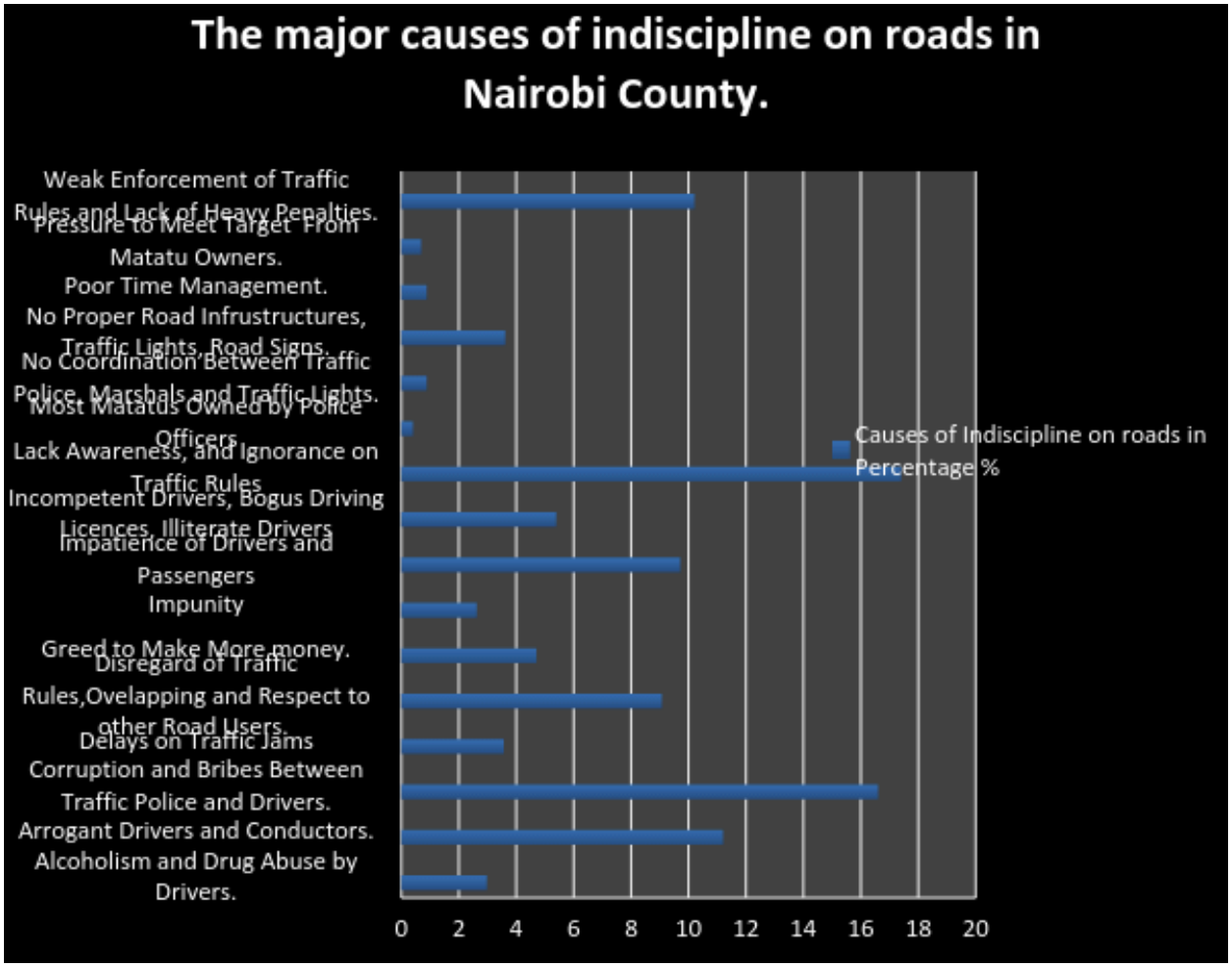


Fig 19 Respondents perception of major causes of traffic congestion

Transport systems

Over half of the respondents felt that the state of roads they used was good, very good or excellent with 31% reporting that they were poor and 11% very poor. Many of them compared the current state of roads to what they were five to ten years ago and commented that there was marked improvement.

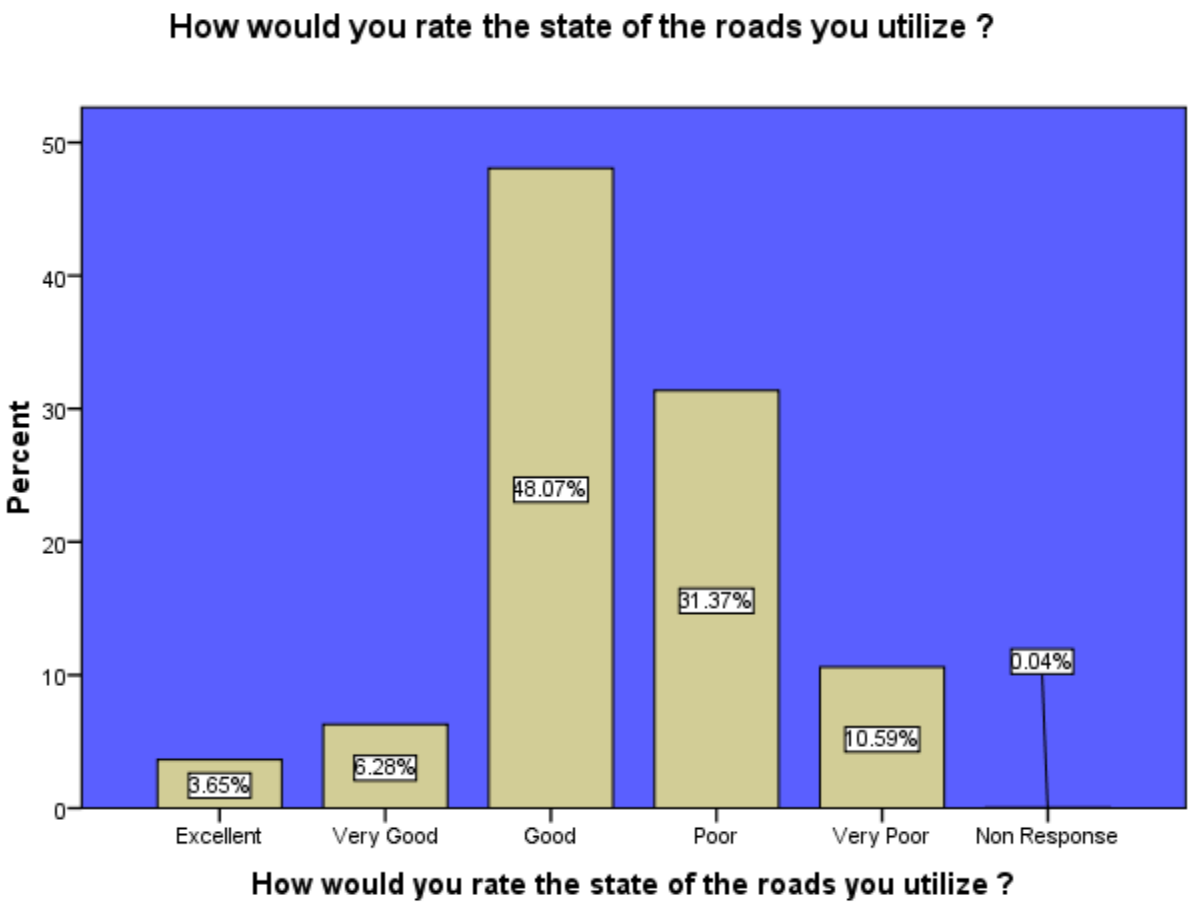


Fig 20 Respondents perception of state of the roads

Forty percent of the respondents reported having used the railway service into town and on asking whether they thought that this service would provide a solution to the city congestion, 80% answered in the affirmative. With the recent initiation of the popular Syokimau, Imara Daima, Makadara service to the railway station in the CBD, it is evident that many respondents would consider this a method for decognestion whether having used it or not.

General public views

At the end of the questionnaire, respondents were asked to give any other comments relating to the causes, effects and possible solutions related to Nairobi Urban congestion.

On road user discipline, there were suggestions that there is need for re-training of road users before strict enforcement of traffic regulations. In addition public education programs in the media should be rolled out to help road users appreciated their role and benefits in respect to causes, effects and strategies to decongest the city. It was felt that public service vehicles particularly matatus needed so as to develop a culture of rule of law.

Police officers were censored and considered corrupt without the requisite seriousness required for traffic law enforcement. Furthermore, corrupt city county officers were reported to solicit money from matatu SACCOs. One respondent noted that "*Corruption is like a killer cancer in our genuine quest to control the traffic congestion in this city".* Strict measures to reduce bribery were suggested by respondents with need to rein i on corrupt police and city officials who have taken advantage of their office positions to extort money from the public. Another said that court fines wouldn't help, and suggested withdrawal of driving licenses would deter drivers from being habitual offenders of such indiscipline behavior like overlapping and obstruction. One respondent felt that counselingdrivers and other matatu crew was necessary so that they are reminded that they were actually dealing with human beings and small mistakes could cause deaths and disabilities. Though the suggested methods differed, all respondents were agreed on

the need to ensure the traffic offenders are severely punished in order to ensure the city is free from corruption perpetuated by traffic police, marshals and city county officers. There are those who felt that fines were not effective and alternative methods of enforcement such as detention and withdrawal of licenses should be investigated.

Some respondents felt that authorities are prone to knee jerk reactions which are dictatorial and these should be avoided. They appreciated the work of the committee but said the County government should be serious and implement recommendations of Nairobians without procrastination. Some believed that though this exercise in time and resource intensive, previously, a lot of money has been spent on similar projects which ended as such "*just talk*". One respondent said that it is high time that something was done and thus once the report was compiled, it should be utilized and all the grievances of Nairobians be given the seriousness they deserved. He felt that Nairobians should not continue being "*taken for granted*".

Non-motorized traffic such as mkokotenis as well as motors bikes were severely censured for it would reported that they were a law unto themselves and did not seem to believe that they were subject to traffic regulations. Police officers were also censured for they seemed to let these road users get away with this behavior which was considered responsible to traffic accidents some with fatalities. Such vehicles some respondents felt should be completely banned from the CBD.

On infrastructure, clearing and regular maintenance of trenches and drainages as well as demolition of kiosks and removal of garbage along roads were suggested as methods of enhancing connectivity. Urgent and regular road repair and maintenance using approved and

qualified road contractors, was necessary. In this regard, eliminating corruption was also a concern in respect to construction and maintenance of quality roads. Many respondents believed that expanding roads, constructing new ones as well as removal of roundabouts and construction of intersections and tunnels would be helpful in decongesting the city.

Plate 1 A roundabout and a traffic congested street in Nairobi

Many respondents suggested that there is need to restrict access to the CBD. Some said that only vehicles in good conditionsshould be allowed on the roads vehicles which were old and un-road worthy should be removed. In addition, there was a common suggestion that most heavy commercial vehicles have no business in the CBD and should use alternative routes. Where they have business, access should be limited to certain times of low traffic use. Furthermore, some felt that ownership and use of private vehicles should be discouraged by levies on purchase as well as automating and charging very high access and hourly parking fees. In addition, car-pooling

should be encouraged by preferential access through segregated lanes for private vehicles with the designated high number of passengers.

Regarding PSV access into the CBD, there was varying views. There were those who felt that access should be encouraged by charging less access and parking fees to public vehicles. Others believed that these vehicles shouldn't be allowed into the CBD but should terminate their journeys at termini at the periphery of the city. A third group believed that limited and controlled access with designated parking, dropping and picking points is the way to go. Other than decongesting, this limited access approach would also reduce corruption. Whatever approaches however, the majority commented that discipline among uniformed Matatu crew was critical to traffic decongestion.

Many said that there is need for a dependable road transport policy including that of non motorized traffic (NMT), taking into consideration a comprehensive urban land use plan. One respondent said that development of a mass transport system using high capacity vehicles was often recommended but not implemented. There was a nostalgic recollection of the good old days of the Kenya Bus which transversed the city through the CBD. This MTS whether bus, tram or rail should not be left in the hands of the private sector and the county and/or central government must be co-owners and shareholders in the crucial public transport systems in Nairobi.

Security was also cited as a concern related to congestion. Street lighting, removal of street boys, banning of Boda boda were suggested as ways of enhancing security in the CBD.

Staggering of working and business hours was another suggestion that businesses can be made 24/7 so that people do not crowd into the CBD during the day. Furthermore schools can be made to start at later hours other than current seven or eight o'clock. Another view was to devolve services by building schools, health centres and markets in residential areas. An even more radical recommendation was encouraging development of other areas so that people are fairly spread out. These areas would provide opportunity for proper planning for cities with less people, less vehicles and thus no congestion.

Qualitative oral, written and electronic submissions

This data is from oral submissions, focus group discussions, in depth interviews as well as written submissions in electronic and hard copies which were received from organizations, agencies and experts in the field of traffic management.

One respondent noted that he had studied the cost of traffic congestion in Nairobi for his MBA and suggested that Nairobi traffic police need to be mobile and they could invest in motor bikes which were now being sold in supermarkets. He noted that Yamahas but observed that they were not being utilized effectively. "How can two riders be parked at the same junction, chatting or purporting to control traffic?" he queried. He submitted that the city does not need an army of traffic policemen acting randomly and erratically. "Visit bomb blast roundabout and see an idle traffic police workforce" he advised.

His suggestion was that road junctions be manned by both Nairobi County enforcement officers and police officers with adequate training. Their roles and responsibilities must clearly be

defined. Each mileage of road should be covered by a police motor bike rider who is at more senior level than the police officers manning junctions. A higher level of mile coverage should be manned by a yet more senior officer who is in contact with his team on the ground. His/her role would be to give direction. It should not be left to each and every policeman to decide when to stop/start the traffic flow for this should be centrally controlled as informed by a data informed intelligent system. This would remove the confusion he claimed to have witnessed at the City Mortuary roundabout where traffic police argued about which side should move.

Furthermore he suggested that there must be at least two airborne senior traffic police officers using helicopters so as to have a bird's eye view of a much larger area. The airborne traffic could operate at peak hours and liaise with the officers on the ground. According to him, coordination of the traffic controllers on the ground is the operative word.

Kenya Private Sector Alliance

According to Edwins M. Mukabanah, the convener of the KPSA, there is need for special purpose vehicles (SPV) which could be:

1. Public limited companies that can be floated on the stock market.

   The company shares can be owned by the national government, county government, operators, vehicle owners or general public (passengers). In this model it is easy to attract a strategic investor who could be government or private investor or operator.

2. Private Company owned by either national or county government or both.

   This will be a private company whose shareholding is fully owned by government. It will be constituted on the lines of companies such as the water and sewage management

companies or electricity management companies. At some point the government could privatise it but retain a strategic shareholding.

3. Union of Transport Cooperatives.

   This model will be built on the basis similar to Kenya Planter's Cooperative Union (KPCU). All transport cooperatives (operator's cooperatives) can come together with assistance of KUSCO or Cooperative Bank to create an entity that can manage transport in a Metropolitan area. Though such a system could bring about management challenges it will be fully owned by current operators.

4. Transport Authority owned by national government.

   In this model the non-profit making parastatal will be created by an Act of Parliament. It will be funded by the exchequer to manage transport. It will be created on the lines of Transport for London whose main aim will be to manage all urban mass transport systems in the jurisdiction of its territory.

5. Private Transport Multinational.

   The county government could put up an international tender inviting them to operate a franchise with the county government running transport operation just as Kenya Bus Service Ltd did in 1966. The county could be buy shares in the company to operate it as a joint venture. Such a venture will encourage transfer of technology and build local human resource capacity.

The best institutional model for Nairobi will be one that smoothly integrates current players who are mainly private sector investors i.e. operators (SACCOs and Franchising Companies), individually registered companies, individual vehicle owners and workers.The model must also be one that seeks to smoothly transform public transport operation from the current one to a formal mass transit one with reduced transport externalities, such as; accidents, congestion and pollution. The model must curb corruption and eliminate cartels. This model must also consider users to the extent that cost of travel and cost of doing business must not increase substantially as to limit mobility and accessibility. In addition, it should be self-funding with minimum operations state subsidy and should be one that encourages private sector investment since public funds are shrinking.

The SPV would provide a win-win solution for PSV industry in Nairobi that promotes a self-sustaining transport system with limited state subsidy on operations but with increased investment on provision of transport infrastructure facilities, such as, bus depots, dedicated lanes, terminals, stations and bus stops. It will be one that will encourage current private sector participation and encourages movement from Para Transit to formal operation. The best model should create benefits as follows.

Government

1. Internalisation of Transport Externalities (Congestion, Pollution, Accidents)
2. Easy to police, regulate and allows government interventions
3. Create new decent jobs for staff in PSV industry

4. Increased Statutory collection from industry
5. Provide the first step towards attaining the MDGs due predictable mobility

Investors

1. Provide a predictable investment climate.
2. Partnership with professionals and gain Know-how of doing PSV business
3. Accountable returns on investment due to reduced wasteful competition
4. Provide a way out to shift from low to high capacity vehicles.
5. Reduced public transport operation overheads due to shared services

Commuters

1. Predictable, affordable fares and journeys
2. A seamless ticketing system with complaint handling office
3. Sustainable, equitable and quality public transport system
4. Increased mobility and accessibility to residents of Nairobi
5. The transport system will take care of; children, elderly, sick and socially excluded

Motorists

1. Reduced traffic jams and therefore lower cost of motoring
2. Decent alternative public transport if government subsidises
3. Better motoring attitudes due to the removal of matatu madness
4. Reduced accidents and therefore reduced Insurance premiums

Businesses

1. Increased sales due to the regeneration of Nairobi's CBD

2. Improved security that creates a 24 / 7 / 365 business culture
3. No need of staff transport, reduced costs of production and distribution

Workers

1. Access to good training and financing through SACCOs, etc.
2. Improved Conditions of Service, such as, (leave, housing, medical, hours of work, pension, etc.)
3. Job security as one can work for any Franchise

Health sector practitioners

There were several submissions by doctors and other health sector practitioners that noted that traffic congestion had effects on the health of people in the city. To start with, they noted that the road traffic system is deadly for at least 800 Nairobians die each year in traffic related accidents, of which more than half were pedestrians. In addition, there are over 2,000 people injured who require health care for injuries of various types at times for extended periods of time. These mortalities and morbidities do not only result in loss of productive years of the victims, families and communities but are unnecessary use of scarce health resources. The country has particularly been noted for high traffic accidents particularly involving public service vehicles such as matatus and buses in addition to accidents involving high commercial vehicles such as tankers where there have been serious mass injuries and fatalities. Of particular note was the increased accidents related to motorbikes - Boda bodas and Tuk Tuks- that ferry passengers.

There are other health related effects of traffic congestions noted by health professionals. One doctor pleaded

> *"Please get rid of all those vehicles spewing thick smoke into the Nairobi City atmosphere. I can tell you as a doctor that it not only affects the poor traffic policemen and city county traffic marshals standing on the roads and pedestrians but also you people at the Nairobi County government offices. You are setting us all up (including yourselves) for non-communicable diseases such as cancer (especially lung cancer) and obstructive airway disease (e.g. asthma and bronchitis). We are all constitutionally entitled to good health and letting smoking vehicles ply the roads is denying the citizenry this right".*

Other than the diseases related to vehicular emissions, other health conditions related to traffic congestion were psychosocial where frustration related to being in confined spaces in cars, among other un-courteous and inconsiderate road users. These situations, according to the health practitioners, are associated with fatigue, digestion problems, pain such as headaches, and other stress related symptoms that may culminate in increased heart rate, reduced concentration, increased reaction times and road rage.

Environment expert

According to the submission of an environmental expert, traffic congestion has serious environmental effects. Particles from brake, tire, and road wear have been cited as environmental pollutants with varied effects to the ecosystem. Vehicular emissions from engines run on fossil fuels which are known to cause pollution with effects to various living forms in the vicinity. In addition, carbon monoxide and dioxide emissions which are by products of motor

vehicle emissions have been shown to have significant health and environmental effects. Heavy metals such as lead, sulphur, cadmium, copper, nickel and lead accumulate in soil and plants and end up in the food with documented effects in organisms in the food chain. However it is the volatile hydrocarbons oxides of nitrogen, sulphur dioxide and carbon monoxide emitted from, among other sources, road vehicles that produce ozone when acted on by sunlight.

Overloading of the earth's atmosphere with heat-trapping carbon dioxide threatens large-scale disruptions in climate with disastrous consequences. The accumulation of greenhouse gases from carbon dioxide has been associated with increase in global temperatures, melting of the ice cap and thus sea level rises that cause flooding of low altitude lands. In conclusion, climate change associated with gases such as are found in vehicular emissions is the single biggest environmental and humanitarian crisis of our time.

Urban air quality is generally poor but is particularly serious at traffic intersections due to variations in vehicles' speeds as they approach and leave. The environmental expert submitted that there is a relationship between traffic characteristics at intersection with vehicular exhaust emissions. These exhaust emissions near traffic intersections are largely dependent on fleet speed, deceleration speed, queuing time in idle mode with a red signal time, acceleration speed, queue length, traffic-flow rate and ambient conditions.

Noise and or vibration generated from road traffic is recognized as pollution and considered the most important major source of community noise. Noise pollution occurs where such noise and sound become unwanted for either interferes with normal activities such as sleeping,

conversation, or disrupts or diminishes the quality of life. There are various environmental effects documentedas a result of noise and vibration and are influenced by many traffic parameters like road surface, tyre, driving behaviour, the number and types of vehicles & infrastructure. As a rule however, noise levels increase with traffic volume in an exponential manner.

Noise has been shown to have a negative effect on living things. In wild animals for instance, noise and vibration have been associated with increased risk of death by changing the delicate balance in predator or prey detection and avoidance, and interfering the use of the sounds in communication, especially in relation to reproduction and in navigation. Acoustic overexposure can lead to temporary or permanent loss of hearing of many species including man.

Other than chemical pollution, traffic causes noise pollution has been shown to be the most important factor considered to be disruptive to the environment and has a negative impact on the desirability of adjacent office and residential preferences.

The expert noted that Environment Management and Coordination Act (1999) has comprehensive provisions for preventing pollution such testing for vehicular emissions at stipulated periods. Enforcement in respect to traffic pollution ishowever poor.

Emergency services

An in depth interview by an ambulance driver who had been in this emergency service for 28 years was very informative. According to his view, there is a marked difference in the response of motorists in respect to giving way for an ambulance when its presence is indicated by a siren.

There are certain stretches of roads in Nairobi where motorists readily give way which include Limuru road between village Market and Museum Hill as well as Langata Road. The respondent said that Waiyaki Way/Uhuru Highway particularly the stretch between Westlands and Haile Selassiewas notorious of motorists not giving way to the ambulance. Motorists on Jogoo, Ngong and Mombasa roads were intermediate in giving way. Furthermore, he said that the worst experience he has hand where an evacuee actually died en route from Kangemi where even pedestrians do not give way. On enquiry to what factors were associated with road users giving way, the ambulance driver said that he thought that it was related to the person having had a firsthand experience in ambulance services. Another possible factor was exposure to other countries where such emergency services were given the requisite preferential access on the roads. Thus, according to him, people who themselves or their relatives had been evacuated in an ambulance and/or were well travelled to other countries were more likely to give way. This is in his view explained why United Nations Avenue was the top of the list in respect to the motorists who were best in giving way for they were most likely to have met these two criteria. According to him;

> *On switching on the siren, all motorists don't only give way but stop at the side of the road on United Nations Avenue leaving the road clear for the ambulance to pass.*

According to the respondent, giving way to ambulances and other emergency service vehicles such as fire engines was a matter of attitude and discipline of road users. Interestingly, compared to private vehicles, matatus which carry the reputation of being most in disciplined, gave way to

ambulances more often. This though may be due to use (misuse he said) of the siren by other vehicles such as those of various VIPS whom private motorists were aware and resentful of.

Transport sector organizations

The view of the Nairobi Metropolitan PSV SACCOS Union is that many of the people passing through the city have no business in the CBD but due to an absence of direct routes to the eastern western and northern parts of the city, they are forced to pass through and thus contribute to the congestion in the CBD. These, contribute to both vehicular and human traffic and thus congestion in the city. The Union proposed licensing of new direct public service routes circumventing the CBD. The cited the example of the old Kenya Bus Services routes that for instance operated between Jericho and Kenyatta National hospital. (appendix on routes)

In this respect, public service vehicles from Umoja, Kayole and Koma Rock terminate at Kenyatta National Hospital having by passed the CBD by going through LungaLunga, Likoni, Enterprise, Lusaka and Lang'ata roads, through Mbagathi Way, City Mortuary and onto KNH. Another example would be vehicles from Thika, Limuru and Juja Roads to KNH via GPO roundabout, Serena and community.

A further proposal for decongestion from the SACCOS was designation of dedicated bus lanes which would ensure high capacity vehicles are given preferences.

Plate 2 Right: Unsegregated lanes in Bangkok Tuk-Tuks, tractors, buses Left: High Occupancy Vehicle lanes separated by a stripped buffer zone that breaks occasionally to allow vehicles to enter and exit the lane.

The Matatu Owners Association (MOA) submission noted that Nairobi requires an optimum, mobile and connective transport system or it to be competitive internationally and for Kenya to achieve Vision 2030of achieving a middle income economy status. They noted that an effective transport system is a catalyst for sustainable development. In this regard, MOA referred to the proposals of the disbanded Ministry of Nairobi Metropolitan which suggested creating uni-directional traffic on several roads (Moi, Harambee Avenues; Koinange, Tom Mboya, and Muindi Mbingu Streets; River, Kirinyaga and Parliament roads as well as City Hall way) dedicated bus lanes; removal of on-street parking from major streets (Moi, Harambee, and Haile Selassie Avenues; Koinange, Tom Mboya, and Muindi Mbingu Streets; River and Kirinyaga roads); construction of multi storied parking slots; constructing and encouraging park and ride systems (Thika, Mombasa and Ngong roads as well as Waiyaki Way); designate drop off and pick up points (Haile Selassie Ave. Agip Petrol station, Wakulima Market area, Railways, St peter Clavers-Kaka, Kencom and Kenyatta Avenue); constructing bus stops and lay-bys to ease

heavy commercial vehicle movement in the CBD. MOA further suggested reinforcement of road reserves on all by passes and ring roads, restricting/enforcing heavy commercial vehicle access to the CBD on weekdays and working hours and allowing high capacity vehicles into the CBD with standing passengers. In they suggested mobile taxis which pick people only at designated areas and encouraging of carpooling to reduce the number of private cars on the roads. A drastic suggested solution was decentralization of the CBD by expanding services to peripheral areas (Westlands, Pangani, Eastleigh, Lusaka Rd, Nairobi West, Langata Rd, Mbagathi Rd and Hurlingham).

According to the submission of the Matatu Welfare Association (MWA), Nairobi City County should immediately revise the parking charges upwards to KSh 500 for non-essential vehicle private vehicles to discourage them from decongesting the City. This, they said should be managed through an automated system. In respect to PSV vehicles, MWA recommended that parking fees for both matatus and mini buses should be lowered in recognition of their role as essential vehicles ferrying Nairobians to their economic activities. In addition, MWA suggested that an intelligent traffic management system should be installed and professionally managed from an efficient control centre.

The Kenya Urban Roads Authority (KURA)noting thatthe Nairobi city contributes a significant portion of the National GDP and is home to about 8 % of the population was concerned that though many discussions on decongestion had taken place, there was little in respect to implementation. KURA submitted that the causes of traffic congestion was the fast rate of population, low and unstable income base, low and uneven income levels of Nairobians, and a

high rate of vehicle ownership among a small but significant minority of the population. In addition, they noted that the majority of the people are captive to poorly provided public transport system that is privately run. Furthermore they cited an increased urbanization in Kenya, poor urban planning and land use, narrow road with slender shoulders and inadequate parking facilities. They however observed that the major cause of congestion is a poorly managed and inadequate public transport and management system. In this regard it is an inappropriate modal split where less than 10% of the cargo discharged from the port of Mombasa is transported by rail thus overburdening and congesting the roads.

Other than the obvious economic and productivity effect of congestion, KURA also noted environmental effects due to noise and exhaust fume pollution with the attendant poor health consequences. They quoted a study carried out in Nairobi showing that over 30% of diagnosed cases in health centres were related to upper respiratory tract infections that may be related to pollution. Road traffic accidents with ever increasing fatalities were cited as both causes and effects of congestion.

According to KURA, short term suggested solutions to decongest Nairobi are expansion and dualing of arterial roads such as Ngong, Juja and Limuru roads; construction of radial roads such as the Outer Ring road; construction of missing links; traffic management plan (TMP), junction improvement and signalization; minimizing right turns; a bus incentive policy; upgrading of existing rail network, and automated parking management systems. Medium term measures to decongest include phasing out of low capacity public transport while developing a mass rapid transit (MRT) system; non-motorized traffic facility development particularly in Nairobi south

and west; construction of by-passes and improvement of freight transport and transit systems as well as further traffic management plan (TMP), junction improvement and signalization. Suggestions for long term solutions are upgraded traffic management plan (TMP), junction improvement and signalization and MRT as well as construction of separate grade junctions in major intersections at the periphery of the city.

Kenya Rural Roads Authority (KeRRA), Kenya Roads Board and Kenya National Highways Authority (KeNHA) also gave similar suggestions. They cited causes of congestions as increased vehicles *vis a vis* road capacity, unnecessary use private vehicles, indiscipline in regard to pedestrian crossing at designated places; large number of heavy commercial vehicles instead of rail option for freight; poor traffic control through out of sync traffic signals and poorly trained personnel as well as obstacles, blockages and bottlenecks due to double parking unplanned road works and accidents. The also cited indiscipline and lack enforcement of traffic rules and regulations with particular reference to corruption. Poor traffic management with particular reference to closure of roads for unnecessary reasons such as passage of VIPs and maintenance purposes was also cited as a cause of traffic congestion. In regard to financing, overreliance to traditional sources of financing was blamed inadequate funding that was not sustained for adequate road maintenance. Overconcentration of services in the CBD and a lack of a mass transport system were also considered important as contributors to congestion. However all of these government agencies said that congestion is as a result of increased vehicles (estimated 10,000 units per month) without commensurate increased infrastructure.

The effects of congestions were economic losses due to increased vehicular operating and maintenance costs, wasted time and fatigue of motorists as well as pollution. Time lost, pollution, driver fatigue and increased insecurity due to reduction of police force from the core business of ensuring security as they are diverted to traffic control. These effects according to the agencies have a net effect of loss of Nairobi's competitive advantage as a regional hub that is attractive to investors.

Short term solutions are punitive parking fees, synchronized traffic control, regulation requiring night road works and speedy clearance of blockages. Also recommended were restriction of transit heavy goods vehicles from passing through the CBD during peak hours; improved discipline of road users through enforcement, and conversion of some roads to one way traffic flow. Medium term decongestion solutions suggested were introduction of a reliable mass transport transit system (MTS) such as high capacity buses with increased stages and stations with secure park and ride facilities. In respect to infrastructure, suggestions are improved capacity at junctions by among others installation of traffic lights, grade separated junctions. Also recommended were completion of by-passes, missing links and additional lanes for critical links; dedicated bus lanes; increased bicycle tracks, packing racks and walkways;encouraged rail freight carriage and increased commuter rail like the Syokimau line. They also recommended staggering working hours.

Furthermore, all of them cited long term master planning to guide infrastructure development where PPP approaches such as tolling to provide requisite funds as crucial to long term decongestion. This planning would include solutions as proper and logical physical planning of

the city; increased rail service; provision for passage of non-motorized traffic and grade separated road systems to increase capacity and development of satellite cities to decentralize services from the CBD. All of them recommended that a mass transport system; bus rapid transit, light rail and/or metro; would be the ultimate long term solution to decongest Nairobi.

Plate 3 The old commuter rail to Nairobi (right) and the New Syokimau commuter rail (left)

Traffic police

According to the Officer in Charge of Traffic, Nairobi County, there are several issues affecting traffic. The first of this is the use of traffic lights in managing traffic in the city. This he said is the most desired way to go in the management of traffic flow in the city, but this is greatly hampered because there are too many roundabouts, particularly Nyayo Stadium, Bunyala Road, Haile Selassie, Nyayo House, St. Paul's and Westlands roundabouts respectively. To enable effective management and flow of traffic, there is every need to do away with the roundabouts in

order for vehicles to be able to move for some distances without stopping thereby easing traffic flow.

The second are infrastructural challenges. For example are undesirable situations where superhighways and highways empty all the vehicles into one road. A particular case cited is how the Thika Super Highway terminates all its vehicular traffic to Tom Mboya Street at the Old Nation Roundabout. This poses congestion and is a challenge in terms of traffic management. The view of the police traffic officials relates to the ability of feeder roads to accommodate the large load of vehicles. In this case, it is necessary to provide alternative routes for vehicles moving past the CBD. There are scenarios where are too many interconnections between streets and streets/avenues. In this case, there needs to be a smooth flowing stretch of traffic. To achieve this, some feeder roads need to be done away with and reduce interconnections so that there is a long stretch of road to drive on before branching on to another road. An example of this is the University There is also a need to factor in the movement of pedestrians and cyclists in the design and use of roads, as this is critical to the movement of traffic.

Another issue cited is street families. In the view of the traffic police, they need to be moved from the city and relocated locations outside of the city. He noted that this had been done in the past but street families have come back to the city. There also need to provide recreational and educational facilities for street families to maintain these families in an orderly manner.

On the issue of transport system, the view of the police traffic department officials was that there is a need to introduce High Capacity public transport systems such as High Capacity Bus and/or rail transport systems. These would reduce and/or replace all the matatus in the CBD.

The committee also interview the National Traffic Police Commandant Deputy Commissioner Charlton Murithi who largely concurred with his officer in charge of Nairobi regarding clearing PSVs from the CBD and having termini outside with high capacity transport into the centre of the city. In respect to the role of his officers *vis a vis* traffic marshals, he believes that with better coordination between his department and Nairobi City County, the two could complement each other especially in view of the inadequate numbers of officers available in the traffic department. Regarding the apparent contradiction between the traffic lights and traffic officers at roundabouts, the Commandant agreed that this would lead to conditioning so that motorists develop a culture of violation of traffic lights. In the long run however, the role of traffic police controlling traffic would be reduced to a bare minimum leaving them to deal with emergencies on the roads. This however would depend on efficient operation and synchronization of the traffic lights.

The commandant also suggested that staggering of working hours would divorce some workers/students form the mad rush in the mornings and the evenings. The government and private sector could thus consider changing these hours and the requisite government authorities would provide the security.

Regarding road users, the commandant noted that pedestrians had the highest fatalities on the roads followed by motorcyclist. Thus, there is need of sensitizing the public on the need to adhere to the laid down rules, regulations and particularly the traffic code.

Acknowledging the reputation of corruption in his department, he said that he had instituted measures of rotating officers to avoid undue familiarization with the public particularly in respect to controlling traffic in a manner influenced by those who required quick passage by "nifungulie". Other measures to curb corruption were collaboration with CID, the anticorruption authority as well as the public to identify arrest, prosecute and sentence rogue officers. In this regard, he emphasized that it is mandatory for all officers to conspicuously wear identification badges bearing their names and service numbers and any that did not faced immediate discipline action.

New initiations such as a punitive system of withdrawing the driving license of a repeat or a serious or accident traffic offender would work but would require tamper proof documents and systems. Another initiative is the mobile traffic court system where traffic offenders are arrested, prosecuted and sentenced on the highways.Concerning the public transport system, Commissioner Murithi again believes that the public should play a greater role in ensuring adherence to traffic regulations. He noted that passengers in matatus actually appreciated and encouraged the crew to break these rules to get them to their designations quickly. Thus the matatu operators violated traffic regulations and overlapped, stopped as at non designated places or did whatever they needed to do to meet the expectations of their clients. This they did with impunity for they were confident that if apprehended by police, they could most probably buy

their way out. Sting operations and undercover work has made some progress in confronting this culture of corruption but the commandant believes that the public should be more involved in reporting any issues observed on the roads. To facilitate this, the traffic department was in the process of developing a website, twitter handle and data centre to capture these reports real time. Furthermore, the SACCOs were playing an important role in enforcing discipline on the members for they can identify one of their vehicles and present it to the police as required. The traffic commandant however noted that the department was grossly understaffed and underfunded thus curtailing efficiency in accomplishing its mandate. For example, each of the 14 highway patrol units only had four litres of fuel daily and had vehicles that were procured in 2004/2005. Furthermore, there was no central transportation system for the officers from their residence to their place of deployment and so they daily had to depend on goodwill of motorists or use their meager resources to get to and fro their work stations. The majority had how morale however there are some who have developed ingenuous ways of traffic control such as the officer who impounded the key of matatus that overlapped. Although such retention of car keys could be an extension of the law that allows an officer to impound a vehicle, such actions are contentious in view of the new Constitutional dispensation where such an action can be interpreted to be violation of human rights. Furthermore, such actions could be open to abuse by rogue officers.

The Commandant recognizes that traffic congestion in the City had an impact not only in the county but the Country as a whole. He believes that with better coordination with the County, NTSA and the parent ministry, the issue of traffic congestion in the city would be resolved.

Engineering experts

An engineer based in Dubai described congestion triggers as population, land use, employment and car ownership in the acceleration phase, demand for infrastructure, congestion impacts, increased costs and decreased funding in the frustration phase which and finally corrective actions and revitalisation in the maturation phase. According to the following figure, Nairobi is in the maturation phase and ready for decongesting.

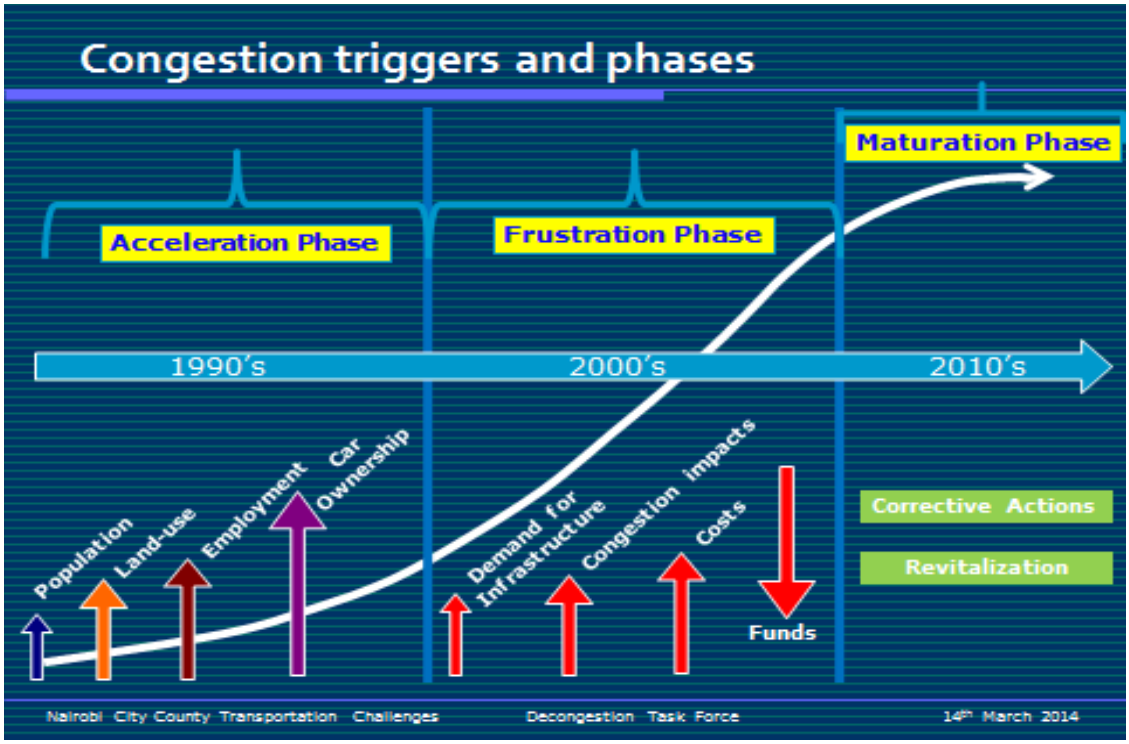


Fig 21 Congestion Triggers and Phases (Eng. Ochieng)

He cited several factors that have brought us to where we are as:

- A lack of transportation master plan
- Inability to manage or control growth
- A lack of a state –owned mass transit system
- A lack of regulations and enforcement
- Absence of traffic management policies and congestion alleviation strategies
- Ineffective parking management system
- A dysfunctional institutional arrangement

- Inadequate funds
- Neglect of sustainability principles

Plate 4 Astreet level parking lot in Nairobi and an automated parking silo

He proposed the following solutions including a transportation master plan for the city that utilizes travel demand models to forecast future travel needs.According to the engineer all decongestion plans worldwide are guided by the following congestion alleviation strategies;

- A comprehensive Congestion Management System
- Managing transportation system supply (new highways, new transit, improve existing highway and transit operation to adding additional capacity to system supply).
- Managing transportation system demand (demand management is any action or set of actions intended to influence the intensity, timing, and spatial distribution of transportation demand for the purpose of reducing the impact of traffic).

In this regard, he suggested a controlled land use plan and enforcement with development that is transportation oriented. Citing various examples, he strongly advocated for a state-owned mass transit system with fast, reliable quality service. This together with a business oriented automated parking system would other than decongest, also provide needed revenue for the City. All these plans however require laws, regulations and policies so as to ensure development and maintenance of the set strategies. This would result in a transport system that conforms toa system that adheres to socio-cultural, economic and environmental sustainability principles.

GAuff Consultants involved in the Harmonisation study presented their submissions on Rail and Road Based Mass Rapid Transit System on Jogoo Road Corridor commissioned by the Ministry of Transport. This was based on the MRTS feasibility study which the harmonization in this case is based on:

a) A proposed MRTS Corridors (8 of 9 going to CBD at one node);
b) Other planned transport systems (commuter rail-LRT) No BRT systems factored in the harmonization though stated;
c) Taking into account changes of spatial structures;
d) Existence of other transport related projects- proposed by KR, Ministry of Transport etc.;
e) voiding parallel investments along Jogoo Road Corridor; and
f) Stakeholder participation as required in law and to give reality to the project.

The Harmonization study focused on discussions with all the relevant stakeholders in respect to harmonization of related reports and studies in an attempt to harmonize standards, principles and

definitions leading to recommendations about future principles and implementation for the future MRTS in the Nairobi Metropolitan Region.

Various MRTS Network Development Adaptations were considered and were mainly based on demand forecast Analysis Reviews, appropriate alignments of future corridors and spatial planning Concepts for the Nairobi Urban Integrated Master Plan (NCC/JICA).

From the above, Graphic traffic models were shown to reduce traffic volumes in the City Centre by having more than 1 NODE. In conclusion, the submission noted that although the presentation was based on RAIL & ROAD BASED MRTS, nothing is presented on the ROAD subject. The Harmonization study brought into focus a rational line of thought in the need to have a holistic approach to the decongestion process; otherwise Nairobi County, Kenya Railways, other ministries will all be investing in separate studies on projects that will not see any light of day.

The committee noted that it appears that the Study was short on details even on the Rail MRTS that is the main focus of this study and the presentation of GAUFF team was good giving opportunity to see how the lack of implementation of many studies results in the need to invest in further harmonization studies that resulting in increased spending. The submission also showed the level of "expert" advice we as a country invest in for not apparent gain.

A consultant engineer gave his submission saying that one issue that every resident of Nairobi can agree on is that something needs to be done about the traffic. He noted that the Kenyan capital is notorious for its congestion, a universal source of frustration that affects everyone across the entire social spectrum. Yet the traffic jams are much more than an annoyance for they

have very real economic, environmental and public health consequences. Direct costs include the loss of productivity due to sitting in traffic rather than working, the additional fuel consumed by extended travel times and the environmental impact of increased vehicle emissions. There are also indirect costs, such as the effect of the environmental degradation on public health.

The engineer noted that there have been intermittent efforts to address the problem, through the expansion of public transportation and the better management of traffic flows, but they have not kept pace with the growth of the city. He said that we are more stuck in the struggles of pleasing matatu owners and operators instead of decongesting the roads because of they form a formidable voting base.

In his submission, the engineer who is well travelled internationally observedthat though Nairobi is large and has a growing population compared to other major cities of the similar size, it does not have a metro system. There also is a similar lack of buses compared to population size. Cars, on the other hand, choke every inch of available road space. The actual rates of car ownership may be low, but the ratio of cars to km of road is one of the highest in the world.

He noted that there is a renewed commitment on the matter for Nairobi's new Governor, Dr. Evans Kidero, has identified the congestion in the nation's capital as one of his primary concerns. He has taken on both a necessary and formidable challenge that will require, among a host of issues, investments in public transportation, increased capacity to manage traffic flows, the creation of safe zones for pedestrians and the reform of politically sensitive matatu industry, which only encourage the use of private cars because of indiscipline and other malpractices.

The real challenge, he observed will be prioritizing objectives, and determining where to invest precious public funds for maximum effect. While everyone may agree on the need to fix the traffic problem, there will be inevitable disagreements on the remedy. It will require a clear and well-structured plan, backed by strong evidence as well as a strong political will.

According to the engineer, the World Bank Group has had extensive, global experience helping other major cities develop plans to manage similar problems. The accumulated knowledge and expertise has to be put at the disposal of Nairobi County authorities, most notably in support of the establishment of the Nairobi Transportation Authority to offer dedicated address of transportation issues in the City.

The specific challenge the Kenyan capital faces is one that needs extensive analysis to be undertaken, by clearly defining the recurring economic, social and environmental costs of congestion, and providing a solid justification for significant public investments in a solution. The study must also put an irrefutable price on inaction.

In conclusion, the engineer submitted that congestion does not have to be a fact of life. Nairobi could be a more livable city, with adequate public transportation for the many that rely on it, and safer, less congested streets for all. As with any seemingly intractable problem, a commitment to take action is the essential first step, one which the National Government must be ready to support with the full range of its resources.

One engineering student noted that we lose an approximate 50 million in lost working hours and fuel cost to traffic jams every day. This is despite several combined efforts to remedy the issue

such as; road expansion programs, creation of one way streets, the recent installation of a traffic light system etc. He believed that the Radio-frequency identification (RFID) technology can aid us in tackling this giant. It consists of a tag and reader that use radio frequencies to communicate with one another wirelessly. Hence, giving it countless applications such as; inventory control, security access management, social media, asset management, product tracking and person identification.The miniature nature of the chips and their ability to store unique data to an item is what makes them ideal to solving our traffic woes. Each vehicle would have its own chip that stores unique data about it. Thus, readers placed at strategic road junctions would be able to track all the vehicles that pass a specific road.

Therefore, assessing traffic violations and optimizing parking spaces would become an electronic task. Furthermore, by linking the database to M-pesa, it would also be possible to collect fines and parking fees electronically. In addition, curbing vehicle theft and clearing roads for ambulances and delegates vehicles would also take on an electronic nature. In conclusion, the massive data collected about traffic patterns will be used in strategic planning of road expansions, hence allowing for savings in research budgets. The trainee engineer noted that before 2011, the cost of the chips and readers were prohibitively high. Nevertheless, costs have now gone down to an estimated Ksh5 per passive chip and a reader would range between KSh 9, 000 to KSh43, 300. He believes that given that this technology is presumably within our price range, is in use in London and other leading cities and several local companies sell and offer software management for RFID device. He wondered why we are not using this technology.

A group of engineering students gave a detailed submission and noted that with respect to the previous studies carried out by Nairobi Metropolitan and the Nairobi County on Traffic Flow Improvements to decongestion the city were addressed and the following proposals given:

- One way (uni-direction) traffic movement-where several roads within the CBD were converted to one way direction to ease movement with minimum adjustments (Successful)
- Dedicated bus routes in the CBD – Not fully implemented
- Removal of on street parking-implemented though not much effect to the flow
- Car park silos-Implemented though not fully controlled
- Park and Ride-not coordinated well and needs to be considered further
- Designated drop and pickup points-fully implemented though still needs further improvements
- Enforcement-this was carried out well though it still needs more attention with the help of a proper traffic management tool.

With respect to the above it would be important to give some more emphasis on the traffic flow improvements rather than considering decongestion, it is indeed a fact that lack of traffic flow management constitutes about 30% traffic congestion on the major roads and intersections.

The observed current problems on traffic management are in respect to synchronization most likely due to lack of proper simulation of the current system and the hardware capacity of the controller to incorporate the intelligence. A lack of central control system mapping traffic in and

out of the CBD and covering the main highway is also a factor. In this respect, looping system for self-detections and controls and power fluctuation are inadequate. There is thus need for a system that can accept different power inputs like Solar back-ups and UPS for controllers within the intersections in addition to a low power consumption signal heads to replace the current power intensive signal heads

Traffic flow improvements represent those actions that can be implemented to enhance the person-carrying capability of the roadway system, without adding significantly to the width of the roadway. The range of roadway facility actions available generally fall under two classifications. Actions primarily oriented to urban freeways or expressways, and the second oriented to arterial and local streets. Most traffic flow improvements are implemented with a focus on the peak period work trip. However, for many of these actions such as the improvement of arterial signal systems, their applicability could as easily be expanded to include traffic conditions throughout the day. The primary objective for improving traffic flow is to enhance the efficiency of the existing roadway system and therefore to alleviate traffic congestion and related problems such as air pollution. Other factors motivating their implementation include financial difficulties in supporting new major transportation projects, and the environmental and physical constraints associated with new infrastructure construction. Moreover, there has been a growing recognition that implementing programs consisting of several interrelated traffic flow enhancement strategies can lead to substantial reductions in travel time and delay.

Proposed Measures for decongestion are traffic Signalization whichrepresents the most common traffic management technique applied on major roads. Traffic signal improvements generally

provide the greatest payoffs for reducing congestion or travel time delay on local and arterial streets. The basic type of improvements available to improve traffic flow on arterials, include: Traffic Flow Improvements such as traffic signal equipment updates such as new, more modern hardware that would allow for the planning of more sophisticated traffic flow strategies.

Timing plan improvements are also necessary where they will be an update to allow traffic signal timing to correspond to current traffic flows to reduce unnecessary delays. In respect to signal coordination and interconnection, there is need for better interfacing of pre-timed signals, traffic actuated signals, actively managed timing plans or master controllers. These measures will enhance traffic progression along corridors and minimize the number and frequency of stops necessary between intersections.

Another strategy is **highway Traffic Improvements.** Incident Management Systems may consist of one or some combination of roving tow or service vehicles, motorist aid call boxes, incident teams, detectors in the roadway lanes to monitor traffic volumes, signage systems, traffic operations centers, contingency planning, and improved information availability to consumers through radio and television stations.

Ramp metering is a proven technique to improve traffic flow on freeways. Using a modified traffic signal placed at the end of a ramp, metering allows traffic to enter the highway either at pre-timed intervals or at times determined by traffic volumes on the ramp or on the highway. Although additional delays are incurred by the ramp traffic, mainline roadway capacities are protected and the overall travel time or speed is improved. Because enforcement costs may be

substantial, the program is typically earmarked for projects potentially having a major impact on area-wide mobility. For example, a periodic program of enforcement along an HOV lane facility or on a major arterial in the downtown core to eliminate vehicle blockages in intersections or to eliminate double parking.

Highway incident management systems responds to congestion that is recurring (i.e., due to capacity, breakdowns, or operational problems) as well as non-recurring or incident in nature

Ramp metering typically requires a considerable amount of time to plan and implement. Of particular concern are potential queues that can form on arterials that feed the ramps and generate severe congestion as a consequence of the action. Motorists may choose to by-pass those ramps where metering has been installed to avoid delays. If enough people do so, this diversion could result in the creation of congestion on arterials that may not otherwise have a problem.

With respect to the above are the following detailed systems and case studies that can form part of the solution and implementation program. It is important to note that for economic purposes, there is need to change existing controllers used in the intersection and install a Master controller; incorporate sensors to the intersection to allow for actuated signalization and insist on a traffic simulation presentation before implementation of system rather than the onsite test and installation that causes confusion and conflict

Other engineers who gave oral and electronic submissions had similar thoughts of a reliable state owned mass transport system, synchronization of signage, automation of parking, modification

of street interchanges as well as strict enforcement of laws. In addition they also recommended concession and tolling where access to the certain parts of the city would be restricted by heavy levies enforced on certain roads. Another idea was the use of metered taxis which would ensure a standardized and reliable system. Dedicated lanes for high occupancy vehicles, emergency and service vehicles as well as motor bike lanes were also a common suggestion in addition to lanes dedicated to NMT such as bicycles and pedestrians. In regard to parking, one respondent noted that suggested that we should utilize various stadia such as Kasarani, Nyayo, KICC parking, Jamhuri ground as parking bays during the week days. This would serve as park and ride facilities near MTS termini and maximally utilize these facilities that are only used during weekends. An example cited was Wembley Stadium serving as parking facility for London.

Plate 5 Congestion on a street in Taipei consisting primarily of motorcycles (Wikipedia).

Digital Matatu Project

The committee also received submissions from Prof Peter WaiganjoWagacha and Dr Daniel Orwa of the School of Computing and Informatics University of Nairobi who were involved in the Digital Matatu Project (http://www.digitalmatatu.com). This project investigated the matatu transport system and among other tasks mapped 130 of their routes with the various designated

and non-designated stages and classified them according to the corridor through which they accessed the city centre (see annexure 6).According to this segregation, there are 18 lines through which all these routes access the CBD and terminate at termini namely, Pangani, Ngara, Stima, Kariokor roundabout, Gikomba, OTC, Muthurwa, Bus Station, Railway, Kencom, Koja/Odeon and the main stage along the alleys connecting Tom Mboya and Kirinyaga roads.

According to them, the causes of traffic congestion in Nairobi are linked to a poor and insecure public transport service – matatus and buses- with bad driver etiquette and a lack of the use of common sense on the roads. These service has a high number of passenger vehicles which terminate their journey in the city centre taking up space and often stationary for long periods of time awaiting passengers. In addition, traffic congestion is caused by a non- optimal road designs such as bus stops (stages), junctions, poor, little or no maintenance of storm water drainage, delayed removal of road obstacles such as broken down vehicles as well as poor and slow management of accident scenes. Furthermore, these two respondents submitted that the large shopping malls and supermarkets are poorly located and contribute to traffic congestion.

The congestion had a negative economic cost, negative health effect, environmental pollution effect and also contributed to reduced road safety by increased incidences of accidents involving motorists, passengers and pedestrians.

The suggested immediate solutions were the reduction of personal vehicles within the city by carpooling as well as an improved public transport system with requisite commuter comfort, safety, security as well as decreased travel times. In respect to road users the two academicians

recommended installation of better road manners whereby the image of matatus would be improved and pedestrians would use the road better. Considering the current commuter rail service, they submitted that there is need to improve the synchrony of the service with that of matatus. The also recommended a cashless fare payment systems and a matatu black box (speed governor with recorded data). These short term solutions they felt would require a policy framework to set up data standards and ownership where all concerned would have access and thus increase utilization of the information.

In the medium term, the Digital Matatu Project team recommended route planning informed by collected data. Thus in the next five years, a review of matatus routes would be necessary ensuring that the journeys terminating in the CBD were reduced to a minimum through introduction of peripheral termini and cross-city routes. They also recommended the creation of a Transport Institute in one of the Universities with a specific mandate to collect data and thus serve as a centre of information and knowledge. These centres would aggregate real time transport data such as vehicle and passenger counts, speed and location; passenger boarding and alighting and accident sites for use traffic control. In addition, they recommended a multi modal transportation system with dedicated user lanes and park and ride points outside the CBD. The systems they recommended which would have high capacity and better quality vehicles would be contracted to matatu SACCOs through competitive bidding of specific routes and regulated to ensure stipulated quality service standards.

In the long term, the two academicians recommended comprehensive transit service provision infrastructure with scheduled commuter high capacity bus and/or rail services. Such would be

achieved through planning that involved key stakeholders such as matatu owners, crew, SACCOS as well as traffic police among others in synchrony to other agencies such as the NTSA. Such planning should be cognizant of data that shows that 51% of Nairobians are low income earners who walk to work.

Nairobi City County

The existence of a City is highly dependent on an efficient and effective transport system that is capable of supporting various economic activities to stimulate growth in the productive sectors of the economy.

The rapid growth in population, due to increased economic activities, has caused a rise in demand for transportation services within the Nairobi City County .This has however not been matched, proportionately, with the expansion of the infrastructure. Consequently, traffic congestion has increased to unmanageable levels

According to previous studies, the following have been identified as causes of congestion:-

i. Lack of land use policy
ii. Lack of functional institutional framework for road maintenance and Transport,
iii. Inadequate physical infrastructure for an effective transport system
iv. Lack of Traffic data
v. Restricted modes of transport
vi. Rapid increase in population and rural urban migration

vii. Inadequate equipment and poor maintenance standards

viii. Inadequate funding dedicated to transport

ix. Inadequate road and junction capacity

x. Lack of accountability, transparency and professionalism in transport management

xi. Insufficient road widths and/or lanes

xii. Poor road surface condition such as potholes

xiii. Artificial barriers such as bumps, broken down vehicles etc.

xiv. Roadside activities such as hawking, construction etc.

xv. Huge time lags in implementation of planned interventions, egg. Some planned junction improvements, bypasses and ring roads have not been implemented.

xvi. Poor management and unbalanced road network

xvii. Unsynchronised, poor configuration, broken down or malfunctioning traffic signals

xviii. Unbalanced manual control of traffic at the intersections by Traffic Police

xix. Inadequate and poor manual management of parking facilities

xx. Poor road use habits by both motorists and pedestrian.

xxi. Lack of strict enforcement of Traffic regulations

xxii. Lack urban transport policy (freight and commercial vehicles, road space priority, NMT, parking etc.)

Although congestion is widespread in the city, there are certain areas with specific congestion characteristics. The major corridors to the Central Business District (CBD)and other commercial centres can be considered the epicentre of congestion. Congestion is encountered on all major road corridors leading traffic into the Central Business District:- Jogoo road/Landhies road from the east, Mombasa Road/Langata road from the south leading to Uhuru Highway, Ngong road, ArgwingsKodhek, Valley road and Kenyatta avenue from the south west, Thika/Muranga road in the north and Juja Road in the north east.

Junctions are also prone to traffic congestion. Almost all junctions along the main road corridors; Uhuru Highway, Jogoo, Landhies, Outering, Murang'a,Limuru, Ngong,ArgwingsKodhek, Valley roads, Kenyatta avenue etc.

The effects of traffic congestion have been identified in previous studies. Health related problems have been recognized due to pollution by noise, carbon dioxide and monoxide emissions as well as dust and other air pollutants. These have been associated with ENT related diseases and global warming. There also are economic losses due to high fuel consumption while stuck in the jam particularly in respect to the high fuel importation costs. In addition is loss of productivity due to manhours lost in the traffic jam.

There also are road safety problems emanating from congestion. Fatigue, frustration, loss of concentration among others have been cited as factors that contribute to accidents and may also hamper the passage of emergency Vehicles

There are proposed interventions to ease traffic congestion that can be segmented according to their cause. Firstly are solutions that require infrastructural development which include those emanating from inadequate road and junction capacity, irrational unbalanced road network and inadequateparking facilities. Secondly are solutions that require policy development, education and enforcement. These emanate from driver behavior, public transport and urban planning.

Short term interventions

These involve making the most efficient utilization of existing road space and network. A key requirement of road transport is to obtain a more efficient utilization of existing road network to provide more capacity when and where it is most needed, coupled with measures to restrain traffic.

To achieve this, a wider use of traffic management techniques is proposed, which include:-

- Reorganize traffic flow into one-way system coupled with removal of on-street parking on selected streets.
- Extensive use of traffic signal
- Carrying out road markings.

- Increase parking fees and better management of available parking spaces by introducing hourly parking tariff – Law courts and sunken car park are already automated awaiting full implementation of timed parking.
- Removal of taxi ranks and making the taxis mobile.
- Stricter enforcement of the traffic act and county laws.
- Ensuring bus lay-bys are not used as terminus and touting for passengers is prohibited.
- Marking of exclusive public transport (bus) lanes
- Relocation of driving schools from the CBD.
- Barring hand-carts from the CBD.
- Restricting deliveries to off peak times.

Medium term interventions

There are several short term interventions which include relocation of buses and Matatus to designated Termini as follows:

- Following the rehabilitation and automation of Machakos bus terminus all upcountry buses will be relocated there.
- Westlands out bound Matatu terminus is complete and Matatus will have been compelled to operate from there. This will in future be expanded.

- Following completion of the first phase of Muthurwa hawkers market and public transport terminus vehicles operating from Jogoo road and Enterprise road have been relocated there.
- Expansion of Muthurwa terminus, up-grading of Lusaka road and improvement of related intersections to accommodate vehicles coming from Mombasa and Langata roads.
- Upon completion of HakatiMatatu terminus, some vehicles operating from Juja road and General Waruinge and Ring road Ngara have been relocated there.
- Upon completion of NgaraMatatu terminus vehicles operating from Murang'a road have been relocated there.
- Vehicles approaching CBD from Ngong road and ArgwingsKodhek can be re-routed such that they enter Processional way from Haile Selassieside pick/drop passengers next to the dais the exit through Kenyatta Avenue at All Saints Cathedral.
- Vehicles approaching CBD from Gen. Waruinge road can be re-routed to terminate their journeys at Kariokor and Mwariro market
- Bus lay-bys will be rehabilitated on all the routes. This was started with construction of bus lay-bys along AgwingsKhodhek road.
- For the areas outside the CBD existing termini like Kibera Olympic (route No. 8) and Njiriri's on outering road will be rehabilitated.

- Other upcoming termini outside the CBD are: -Pangani shopping centre, Park road and Ngara road, Desai road and Muranga road terminus.

In addition is the proposed medium term intervention of relocation of matatu termini for vehicles operating from various corridors. The Northern corridor vehicles comprising of vehicles from Thika road, Kiambu road, Lower Kabete road and Limuru road. There is an open ground next to Ngara Girls and subject to availability/acquisition of the land a matatu terminus can be constructed to accommodate these vehicles. Regarding the North Western corridor vehicles coming from Waiyaki Way, there is an open ground between Kijabe Street and Kipande road along Nairobi River recently developed into a park. Subject to availability/acquisition of this land a matatu terminus can be constructed to accommodate these vehicles.

A public transport (shuttle bus system)within the CBD is proposed as a medium term intervention. A new high occupancy shuttle system is proposed in order to inter connect the proposed termini at Muthurwa, Ngara road, Park road, Murang'a road, Kariokor, Westlands, Machakos and Railways. The current 33, 41, 51 and 62 seater buses owned by various SACCOs could be organized to fit in the envisaged shuttle services under terms and conditions by the Nairobi City Council.

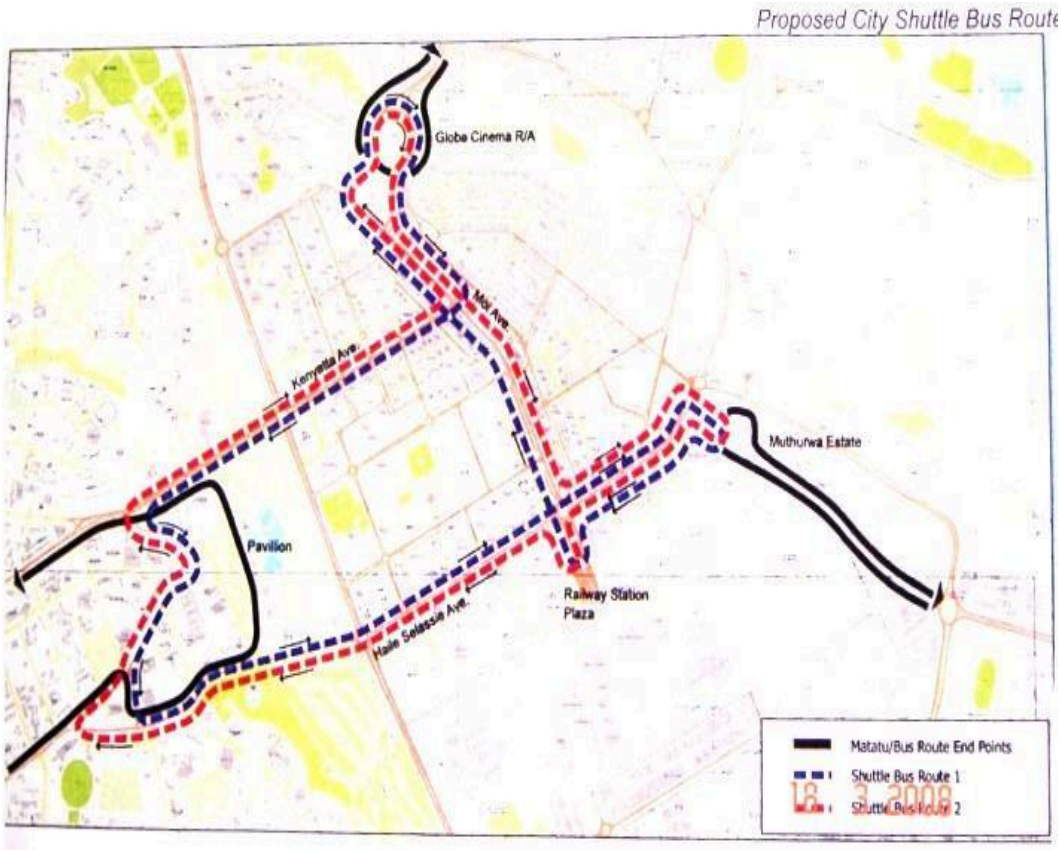


Fig 22 Proposed City Shuttle Bus Routes (Nairobi City County)

The final medium term intervention will involve provision of well defined Non-Motorized Transport (NMT) corridors to connect the CBD and the termini. Furthermore will be provision of NMT parking facilities.

Long term interventions

Lastly are long term interventions to decongest the city which include development and maintenance of a mass transit system. There are various options of mass transit system e.g. Bus rapid transit (BRT), Tram and train the choice between which is dependent on availability of

funds and the projected long term transport strategy. To realize this, the following inter-change points are proposed.

- **Thika Road corridor:**

  The county proposes to have an interchange/termini at Kasarani next to the sports complex whereby land need to be acquired and set aside.

- **Ngong Road corridor:**

  The county proposes to have an interchange/termini at Dagoretti Corner next to Jamhuri park whereby land need to be acquired and set aside.

- **Mombasa Road corridor:**

  The county proposes to have an interchange/termini at Mlolongo whereby land need to be acquired and set aside.

- **Waiyaki Way corridor:**

  The county proposes to have an interchange/termini at upper Kabete campus next to Kenya sugar board Headquarters whereby land need to be acquired and set aside.

- **Kangundo road corridor**

  The county proposes to have an interchange/termini at Njiru whereby land need to be acquired and set aside.

The proposed interventions will require reforms to be carried out in the existing institutional frame work to align the functions to the current Constitution and the new government set up. The

above interventions can be implemented through a harmonization of roles between the following institutions which are currently mandated under various Acts of Parliament to manage transport in one way or the other: -

- National Government (NTSA) - Makes the policy, i.e. rules and regulations and standards regarding road safety, licensing etc.
- County Government-, Provides the infrastructure i.e. Roads, termini, and parking's, traffic management and enforcement.
- Public service operators, SACCOs and Companies to provide vehicles, personnel and manage them.
- Private investors- Funding i.e. grants and/or loans, education, insurance, etc.
- Commercial banks- Funding
- Donors-Funding for infrastructure development.
- Traffic Police- Enforcement

Current & proposed projects that affect traffic flow to NCBD

Over the past few years there have been a large number of infrastructure projects by the road authorities, KENHA & KURA, at different stages of implementation, which will alter the operational and traffic patterns and standards of NCBD roads. These proposals include, but are not limited to:

- Construction of Thika Super Highway (completed)

- Construction of Northern & Eastern Bypass (95% complete)
- Construction of Western Ring Roads (Ongoing)
- Upgrading of Lang'ata road (Ongoing)
- Construction of Upper Hill roads- phase I (Ongoing)
- Construction of Southern Bypass (Ongoing)
- Dualing of Ngong Road-phase I (under design)
- Construction of Eastern Ring Roads (Under procurement)
- JKIA to Mombasa road to Rironi (under design)
- Upgrade of Urban Traffic Control Centre at City Hall (ongoing)
- Consultancy services for BRT service plan for entire County of Nairobi BRT network (to commence)
- Consultancy services for feasibility and detailed design of BRT on Juja road, Outer ring Road and Jogoo Road corridors (to commence)

Plate 6 Traffic congestion detector in Germany (Wikipedia).

These are the current view of the Nairobi County government on the causes, effects, possible and planned solutions related to the traffic congestion in the city.

Legal expert

Noting that all decisions and activities must comply with the law, it is evident that there is need for supportive legal contextualization. The following provides the framework relating to traffic decongestion in the Nairobi,

The Constitution of Kenya, 2010, through Chapter 11, lays the foundation for devolving functions and services to units now set up known as County Governments. In the Fourth Schedule to the Constitution, there is set out in detail the functions to be devolved to the county Governments and the timelines by which they should be devolved.

The County Governments Act, 2012, was enacted by parliament to give effect to Chapter 11 and the Fourth Schedule to the Constitution in order for there to be proper transition to county governments and more importantly, to devolve functions and services to the people through county governments.

For the purposes of the transport and urban decongestion committee, the relevant legal sections of the various Acts of Parliament that have a direct effect on the management of transport in the county are the following:

1. Section 21 of the National Transport Safety Authority Act, Act No. 33 of 2012.

"(1) The Authority may establish in each county, a committee to be known as the county transport and safety committee.

(2) A county transport and safety committee established under subsection (1) shall consist of—

(a) the officer in charge of traffic in the county who shall be the secretary to the committee;

(b) two persons responsible for overseeing the registration and licensing of vehicles within the county nominated by the Board;

(c) one person nominated by the Association of Public Transport Operators to represent the Association;

(d) one person with knowledge and experience in matters relating to transport within the county nominated by the county governor; and

(e) two persons nominated by the county governor on the recommendations of the Authority to represent such special interests within the county as the Authority shall determine.

(3) Notwithstanding the provisions of subsection (2), where the county transport and safety committee is constituted before the first elections under the Constitution, the Cabinet Secretary shall nominate persons under subsection (1)(d) and (e) and shall hold office pending the appointment by the county governor.

(4) The persons nominated under subsection (2) (b), (c), (d) and (e) shall be appointed by the Cabinet Secretary by notice in the gazette.

(5) The members of the county transport and safety committee shall appoint from amongst themselves, a person who shall be the chairperson of the committee.

Section 22 of the same Act provides as follows:

Functions of the county transport and safety committee

Each county transport and safety committee shall be under the direction and supervision of the Authority and shall—

(a) oversee the management and regulation of the road transport system by the Authority at the county level;

(b) prepare and submit to the Authority such audit reports as the Authority may require on the safety, reliability and efficiency of the road transport system within the county;

(c) advise the Authority on matters affecting the road transport system within the county; and

(d) perform such other functions as may be assigned to it by the Authority.

2. Section 6 of the Urban Areas and Cities Act, Cap 275 Laws of Kenya, enacted pursuant to Article 184 of the Constitution.

"Management and infrastructure in the capital city

(1) The capital city of Kenya is Nairobi.

(2) The capital city shall be governed and managed in the same manner as a county government.

(3) The capital city shall provide infrastructure necessary to sustain the following;

(a) the seat of the national government;

(b) offices of diplomatic missions;

(c) efficient transport network connecting to rural areas, towns and other local, regional and international cities; and

(d) commerce and industry.

(4) The capital city shall decentralize its functions and the provisions of its services to the extent that it is efficient and practicable to do so.

(5) Subject to subsection (2), the two levels of government shall enter into an agreement regarding the performance of functions and delivery of services by the capital city.

(6) An agreement entered into under subsection (5) may provide for—

(a) the administrative structure of the capital city, subject to the provisions of this Act;

(b) funding of operations and activities of the capital city;

(c) the joint projects to be undertaken by both governments in the capital city;

(d) dispute resolution mechanisms; and

(e) such other information as the two levels of government may determine."

3. The County Governments Act, Act No. 17 of 2012.
4. The Kenya Roads Act, Cap 408 Laws of Kenya, more specifically Sections 3 – 12 thereof and the First Schedule, in so far as they deal with the management and upkeep of roads.
5. Section 19 of the Kenya Railways Act, Cap 397 Laws of Kenya.

> *"Provision of transport services, etc., other than by the Corporation*
>
> *Except with the consent of the Minister and subject to the right of the Government to provide and operate transport services, other than the carriage of passengers or goods for hire or reward, for its own purposes:*
>
> *(a) no rail transport services shall be provided; and*
>
> *(b) no railway shall be constructed for the carriage thereon of goods or passengers for reward,within Kenya by any person other than the Corporation or a person appointed in accordance with section 11A, or, to the extent permitted by law, the Kenya Ports Authority."*

The overarching theme noticed from these sections of these acts of parliament is that they have a direct and possibly impairing effect on the county achieving its objectives in decongesting the city effectively.

There is in effect a multiplicity of roles and functions, with some of the core functions required for the effective decongestion of the city lying with national government agencies. In effect, with the current legislative framework as is, the county government can only do so much, without having to go to the National Government agencies to complete their part. The converse is also true, which creates a situation where passing the buck in terms of who is supposed to do what is prevalent.

Article 191(3) of the Constitution provides that national legislation shall prevail over county legislation to the extent that it seeks the protection of the common market in respect of the mobility of goods, services capital and labour.

This sub article seems to justify KENHA's mandate in retaining control of the management of the National highways; it does not, however, give KURA or KERRA any mandates as their functions are supposed to be devolved to the county governments pursuant to Schedule 4 of the Constitution.

Moreover, with the above Sections of the Acts of Parliament quoted above, it would appear to suggest that in managing the transport affairs of the county, invariably, because Nairobi is the Capital City of the Republic of Kenya as well as a county, would be vested both with the National Government as well as with the county government, creating a multiplicity of roles. The position would be different; however, if Nairobi was a federal authority and the management of its functions was vested with the National Government as is the case in Abuja in Nigeria and Washington DC in the United States of America.

It would be prudent for the County, in deciding how to implement the report put forward by this committee, to consider looking into these legal provisions and possibly having them amended through an Act of Parliament that specifically deals with the management of infrastructure in the county, in order to own the management process as is the case in all other major capital cities in the world. KENHA, however, should retain its mandate as it is best practice worldwide for a national government to have an agency specifically for the maintenance of any highways used

for the national movement of goods and purposes and also because it is in line with Article 191 (3) of the Constitution.

In line with the mandate of this committee, the legal regime surrounding transport and urban decongestion is enumerated above, but in considering the drafting of the transport policy in line with our terms of reference, it may be of crucial importance to harmonize, codify and streamline these laws in the event that a single body is to be created to manage and run the county's vast transport infrastructure.

EMERGING ISSUES

The committee has noted that since the presentation of the interim report, the following new emerging issues have arisen that require to be addressed:

1. Mandate and Responsibility:
    a. Traffic management issues:
        i. There currently are about 140 junctions without computerized signals. There is need to increase the number of junctions to about 1000 to allow proper and efficient traffic in and out flows into the CBD. In addition, all these junctions require full computerization and automation to remove the variable subjective human factor.
        ii. Traffic issues are convoluted at the moment: there needs to be a harmonization of the same. In this regard, the committee must recommend the creation of traffic management department.There are areas of operational concern such as the legal role of the Traffic Marshalls*vis a vis* the role of the traffic department within the National Police Service. This has an impact on enforcement of the laws and regulations for it is currently who is effectively in charge of the traffic problem in the City County. There needs to be a system where national government agencies and county government agencies work in tandem to promote accountability. As far as Nairobi County is concerned, within Nairobi County, the buck stops with the county government.
    b. Mandate issues:

There is confusion between various national and county government actors as to which actor performs what functions. To end this confusion, it is proposed to create an inter agency framework that will fast track the devolution of functions and resources from national to county government and deal with any teething and/or emerging issues.

2. ITMS Issues:

   Intelligent Traffic Management System (ITMS) technology should be utilized to help manage the traffic.The ITMS to be implemented by the county must be completely devoid of all human interaction on the ground and must be run at the central hub by qualified personnel: that is qualified traffic and transport management engineers. The system must also be dynamic to allow for expansion and/or upgrade of the same to meet future challenges and obstacles that might occur.

3. Devolution Issues:

   Transport and traffic are devolved functions. The two arms of government, that is national and county, must define their roles clearly and it must be understood which organ performs what functions, to enable the smooth running and management of all traffic issues within the county.

   There is need to fast track the implementation of the NTSA Bill, especially Section 22, which refers to the County Transport and Safety Committees.

4. Public Engagement and Awareness Issues:

It is understood that there must be engagement through all levels in order to smoothly implement and enforce the rules and regulations and, most importantly, to create attitude change within all persons who use the transport system one way or another. This campaign must be a continuous campaign that must be consistent and must be drummed into the citizens of Nairobi.

5. Disaster Management Issues:

   It has been noted that there is no institution within the county that is mandated to handle disasters and/or calamities that occur. Disaster management is a key area that needs to be addressed as there needs to be a first response team to any incident that occurs within the county like accidents, fires, terrorist attacks, etc.

   It is hereby recommended that as a matter of urgency, the county does look into setting up a disaster management and response department that shall act as a first responder in cases of disasters or calamities occurring within the county.

   It is also recommended that there should be right of way of all emergency vehicles, and dedicated lanes for the emergency services should not be used by used by VIP's.

   Because developing infrastructure takes time, it is recommended that the existing infrastructure be used to accommodate dedicated lanes for the time being, as development of further infrastructural capacity is undertaken.

   Seasonal dedicated lanes can also be created and enforced, and this is an area where traffic marshals can be effectively deployed, especially in high density traffic areas and

times, For example, on Langata road in the morning and evening hours, on Thika Super Highway, and within the CBD as designated times.

DISCUSSION

The knee jerk solution to congestion is that ofbuilding new roads, widening existing roads, constructing fly-overs and elevated expressways. Such as an approach has been likened to increasing the size of clothes to deal with increased weight! This unfortunately may be politically correct but may not easy traffic congestion for such infrastructural projects may actually increase vehicle traffic. This was observed by master builder, Robert Moses, who in 1942 observed that the highways he built around New York in 1939 were somehow generating greater traffic congestion than had existed previously.

Since Moses's intuitive observation, the relationship between roads supply and traffic congestion has elicited robust scholarship. A study of interstate highways in US cities showed that increased supply of highways did not ease congestion in the absence of congestion pricing. Furthermore, in Southern California, it was noted that expanding highway capacity only had a cosmetic effect on Los Angeles traffic. This has been described in Braess's paradox where adding road capacity might not only fail to ease traffic but make congestion worse. This paradox is based on a mathematical model that states adding extra capacity to a network when the moving entities selfishly choose their route, can in some cases have the opposite effect and actually reduce overall performance. Thus an extension of the road network may cause a redistribution of the traffic resulting in longer individual running times and adding road capacity could actually have the opposite effect resulting to increased traffic flow.

This paradox was demonstrated in Stuttgart, Germany when massive investments into increased road network in 1969 were made, the traffic situation did not improve until a section of newly built road was closed for traffic. In a similar situation, Seoul, South Korea, speeding-up in traffic around the city was only seen when a motorway was removed. Furthermore, the closing of 42nd street in New York City in 1990 reduced the amount of congestion in the area. In 2008 Youn, Gastner and Jeong ("Price of anarchy in transportation networks: efficiency and optimality control". *Phys. Rev. Lett.***101,** 12: 128701) demonstrated specific routes in Boston, New York City and London where due to Braess's paradox, may occur and pointed out roads that could be closed to reduce predicted travel times.

In the short term, increased highway capacity makes commuting less irritable and more attractive thus more people are willing to live to travel. As more people make similar decisions and commence their trips, roads get crowded leading to resumed agitation for additional lanes, wider and even more roads. A study by University of California at Berkeley found that for every 10 % in highway capacity, there is a corresponding 9% increase in vehicle traffic within a four year period(Carlos et al 2011). This is a disturbing idea considering all the resources spent on road expansion will accomplish an increase in time spent in cars in traffic jams!

Road expansion by increasing lanes or constructing new roads is certainly not a panacea for traffic congestion.Recognizing that traffic congestion is not unique to the City of Nairobi, interrogating how other cities have dealt with a similar challenges may provide ideas of best practices that may be emulated and adapted accordingly.

According to Tom Tom Annual report of 2013, the world's ten most congested cities are Moscow, Istanbul, Rio de Janeiro, Warsaw, Palermo, Marseille, Sao Paulo, Rome, Paris and Stockholm (China org.cn).

SAO PAULO

According to this report, the City of São Paulo has the world's sixth worst daily traffic jams setting the record of 309 km queues in the evening rush hour on November 15, 2013. To decongest this city of 20 million people, several approaches have been used. Since 1997, road space rationing control the number of vehicles into the city by last digit of the plate number during week days. This strategy met with limited success and was in 2008 expanded to also include restriction of trucks and light commercial vehicles into the city.

Plate 7 Right: Typical traffic jam in São Paulo downtown, despite road space rationing by plate number. Left: The great Sao Paulo traffic jam of November 15, 2013 (Wikipedia)

BEIJING

The world record of the worst traffic jam is held by China where in August 2010 where in Hebei province, a traffic jam of over 100km was observed. For 11 days between 14th and 26th, there was a total gridlock with vehicles at a virtual standstill. Towards the end of 2010, decongestion approaches in Beijing included limiting the number of new plates issued to passenger cars to 20,000 a month and barring cars of non-Beijing plates from entering areas in the City.

Plate 8 Beijing traffic (Wikipedia)

DUBAI

Dubai is officially the most congested city in the Middle East with the reputation of having serious shortage of parking space. An oil-driven economic boom, ready availability of auto financing and absence of public transport network have resulted in greater demand for private transport and a sharp rise in car ownership. With high rents in the City Centre, many residents seek cheaper accommodation in locations far from the city further increasing the traffic problem.

Dubai's decongestion strategy is to reduce the number of private cars into the city by encouraging carpooling, limiting access by last digit of number plates, encouraging bus service for employees and banning trailers, trucks and other heavy/long vehicles truck for a certain time every day. To date, the car ownership rate in Dubai is 541 cars per 1,000 population. Furthermore, a limiting parking charge is a medium term approach where it costs the equivalent of USD 23 (KSh 2000) per hour in the central business district. Revenue from parking is the second most important income earner to the next to petroleum. In addition, use of roads is charged as infrastructure just like water and electricity. Thus, when for instance a new shopping mall is constructed, or a change of user is granted, a charge is levied for increased use of the adjacent roads by increased traffic due to the clientele attracted by the development.

Alternative methods of travel within the city are provided by an effective public bus, taxi, metro, tram and water transport systems. The Dubai water and road bus system for example, transports over 30 million people weekly. It is believed that a modern urban rail system, the Dubai Metro, when completed will be a long term solution by providing an effective, comfortable and safe mass transit system.

NEW DELHI

The Delhi has metropolitan region has 11.2 million vehicles with the city centre having 5.5 million. The strategy for decongestion is to encourage usage of public transport in the city. In the 1930s, the public transport system in Delhi was privately operated however, but in 1948, the

public Delhi Transport Corporation (DTC) bus system was established followed by Delhi Metro, a rapid transit system in 2002.

In New Delhi, the traffic menace has been alleviated by use of Rapid transit through dedicated bus lanes metro, monorail and light rail systems. In 2010–11 it was reported that less than private vehicles account for only 30% of the total demand for transport, while the rest of the demand is met largely by auto-rickshaws, taxis, rapid transit system and railways. The bus transport systems caters for about 60% of Delhi's total demand with the state-owned Delhi Transport Corporation (DTC), owning largest fleet of Compressed Natural Gas (CNG)-fueled buses in the world.

New Delhi's highly efficient public transport system is undergoing rapid modernization and expansion for the Delhi Metro to have 413 km, the Bus Rapid Transit (BRT) system 292 km and 50 km each of monorail and light rail by 2020. An innovative system to fund a mass transport system by affiliating with IBM is an example of a public private partnership approach to resolving traffic congestion.

SINGAPORE

Singapore is an example of use of technology for traffic decongestion. AnElectronic Road Pricing (ERP) scheme deters traffic congestion during peak hours at various roads. This scheme utilizes electronic gantries placed over the road at designated locations and that recognize an In-Vehicle Unit (IU) device pasted on the inside of the car front windscreen to deduct the toll price from a Cash Card. Failure to use the cash cared is in violation of law.

Furthermore, the cost of parking in car parks can be deducted from the Cash Card inserted in the IU of the vehicle, thus eliminating the need for the car park to have an attendant. Some car parks in Singapore are even more advanced, containing car parking space sensors which detect whether the position is filled or not. This information is processed and displayed in signs around the car park, directing drivers to areas where there are free spaces.

However the stringent but effective strategy in Singapore's decongestion strategy is the Certificate of Entitlement required for each new vehicle. This is a heavy fee added on the costs of a new car which as of 2013 is $87,109 for vehicles1600 cc engine and below and $92,901 for those1601 cc engine and higher. The COE permits ownership of the vehicle for a period of 10 years after which the vehicle must be scrapped or another COE paid for allowing an additional 5 or 10 years of usage removing old vehicles from the roads.

In addition, certain roads and expressways in Singapore are subject to the Electronic Road Pricing (ERP) system further discouraging use of private vehicles and encourage the use of the very efficient MRT and metro. These strategies have decongested Singapore to having one of the lowest ratios of 111 cars per 1,000 people.

Traffic congestion in London has been a problem ever since the city was founded - for example average traffic speeds are known to be similar today to what they were in Victorian times when it was predominantly horse drawn. Although cycling has increased in recent years, and bus usage increased due to massive subsidies to bus operators, traffic congestion is still a major problem.

London is an example of a multi-pronged traffic decongestion strategy with the greater London Authority believing that the solution does not lie in improvement of the road transport network but in the public transport. The city is designated into zones with increased congestion charge the closer one gets to the City Centre. The London congestion charge is levied on most motor vehicles operating within the Congestion Charge Zone (CCZ) in central London between 07:00 and 18:00 Monday to Friday. The standard charge is £10 for each day, with a penalty of between £65 and £195 levied for non-payment. Enforcement is by automatic number plate recognition (ANPR). Other than reduce congestion, the charge raises investment funds for London's transport system. Enforcement of this charge is through a network of cameras located at all entry and exit points to the charging zone, as well as at key locations within the zone.

Vehicles exempt from the charge include buses, emergency vehicles, taxis, low emission cars, electric vehicles and the disabled. People residing within the charging zone are entitled to a 90% discount. Methods of payment have gradually changed from manual retail channels to electronic deductions from the driver's bank account. It is believed that this strategy has resulted in a 20% reduction in traffic in the central zone leading to 345 cars per 1,000 people.The London congestion charge encourages motorists to park outside the charging zones and ride the bus, tram and metro which are readily available efficient mass rapid transport systems.

Decongestion in Nairobi requires a multifaceted and integrated approach, which goes beyond simple decongestion solutions of infrastructural change by increased lanes and roads. The short term approach will be for the next year or so in recognition of the incomplete projects such as the by-passes which on completion will divert transit traffic from the city centre. Medium term

approaches however will be for longer periods of up to five years while long term plans will be for the Nairobi of the future (over five years) taking into consideration the population and economic projections.

CONCLUSION AND RECOMMENDATIONS

Like other cities of the world, congestion in Nairobi has increased over the years due an increased road user population without commensurate infrastructural development. Thesearethe views of the Nairobians as captured by this committee who particularly mentioned the following causes and possible solutions regard urban and traffic congestion.These recommendations have been made bearing in mind that transport is not about vehicle movement but movement of people and goods from one point to another.

1. Regarding infrastructure the following were observed and recommended:
    a. There is poor road layout bottle necks such as roundabouts and intersections that concentrate and slow traffic
        i. Construct of lay bys.
        ii. Dual of major roads with heavy motorization.
        iii. Implement a one way circular type of mobility for example turning some streets into one way within the CBD
        iv. Reduce roundabouts and replace them with manned traffic lights orinterchanges
        v. Expand feeder roads joining super highway, highways, avenues etc.
        vi. Redesign roads to improve street linkages and connectivity
        vii. Reduce interconnecting roads to allow arterial movement of vehicles
        viii. Create more foot bridges and walk ways.

ix. Regularly clean and maintain roads, drainage and remove garbage along the roads

x. Clearance of all the buildings and kiosks encroaching on the roads.

xi. Increase street lighting

xii. Enforce existing manuals and standards for infrastructural development

b. There is a lack of alternative routes for transit traffic

i. Fast track construction of by- passes

ii. Provide alternative routes for the vehicles moving past the CBD, for example constructing elevated roads to segregate transit traffic

c. There is a lack of dedicated lanes to prioritize traffic

i. Construct of dedicated lanes bus lanes dedicated lanes for use by

- buses for exclusive use by public service vehicles, for example alongMombasa andValley Roads, Uhuru Highwayand Kenyatta Avenue
- Emergency vehicles such as fire engines and ambulances
- Cyclists
- Pedestrians

d. Invest in rail transport by

i. extend existing railway lines

ii. develop light rail network within the CD

e. There is inadequate parking

   i. Angle parking should be abolished within the City Centre

   ii. Limit parking on the street to a bare minimum and increase street parking areas within the CBD by

      - construction of private parking silos
      - require adequate parking space within buildings as one condition for approval of development plans

   iii. Create parking spaces at the major corridors entry to CBD with park and ride areas where private cars and non- essential vehicles can be left with provision of adequate security.

   iv. Construct parking silos preferably on PPP where private developers are given incentives

   v. Provide parking for NMT e.g bicycles, motorbikes

2. Regarding access into the CBD the following was observed and recommended;

   a. There is unlimited access of all kinds of traffic into the city

      i. Re-introducetransit routes so that no public vehicles should stop in town to wait for passengers.

      ii. Provide drop off points in the City Centre for public service vehicles.

      iii. Matatu and mini buses should not access the City Centre.

      iv. Route licenses should be strictly enforced

v. Taxis should not park within the Central Business District but they should be mobile and circulating.

vi. Restrict cargo deliveries to the weekends or at night within the CBD.

vii. Only essential and emergency services vehicles should be given preferential treatment on the roads.

viii. Ministers and senior government officials and other government vehicles should not be given preferential access treatment.

ix. Encourage carpooling through incentives such as dedicated lanes for Heavily Occupied Vehicles (HOV).

x. The Nairobi City County should establish 5 mega PSV termini at the periphery of the CBD as follows

- Muthurwa- buy all the land available there.
- NSSF land between GPO and Laico Regency Hotel- build a 10 storey park building with first four floors should be designated for PSVs only.

b. There is no segregated access to private and public vehicles

i. Discourage private vehicles from the city centre

ii. Reorganize taxis through zoning encouraging circulation rather than parking

iii. Develop BodaBodas,Tuk-Tukand Mkokotenizones and ban commercialmotor bikes from the city centre.

iv. Relocate parking bays for lorries and tankers to outside the CBD, for example in Kitengela Area, Ruai Area

c. There is no congestion pricing in Nairobi.
    i. Use tolling and concessions to limit vehicles into the city
    ii. Increase parking fee for private and non-essential vehicles within the CBD.
    iii. Institute hourly parking charges be higher to discourage vehicle parking in the CBD for longer than is necessary
d. There is no strategy discourage private car ownership
    i. develop a legal instrument for car ownership to discourage multiple car ownership

3. Regarding transport system, the following were observed and recommended;
    a. The public transport system is informal, uncoordinated and privately owned
        i. The management of Public Service vehicles should be improved by the County because more than 65% of the people use public means to get into the city.
        ii. Invest in a high capacity mass transport system (MTS) such as high capacity buses with National/County government interests. Such a system is a service that the county owes to its residents
        iii. These public service vehiclesshould be operated preferably on Public Private Partnership with standardized performance levels. It might be

necessary to explore innovative partnerships without relinquishing government control.

iv. Develop and implement a win-win formula in respect to public service control transition from the private service by matatu and minibuses to the county.

v. Extend the rail service such as the Syokimauto other areas.

vi. The County should improve security in public transport so as to encourage users of private vehicles to use public transport

vii. Develop a public school transport system as a service to city residents

viii. Mobilize public funds from a multiplicity of sources

- development partners
- private sector
- public funds such as fuel levy, county and national treasuries

b. The public transport system of matatus and minibuses is low capacity

i. Develop and operatesafe and reliable integrated high occupancy mass transport system

ii. Higher capacity public service vehicles should be licensed to transit across the CBD similar to what i.e. transit, timing, safety and security Kenya Buses did in the 70s and 80s.

iii. Introduce cable- articulated buses in CBD, Westlands and Industrial Area.

iv. Develop a light rail transport network

v. Implement a park and ride transport system at mass transport system termini

4. Regarding discipline on the city's roads, the following were observed and recommended:
    a. There is gross indiscipline lack of courtesy and violation of traffic rules and regulations among road users.
        i. Enforce use of foot bridges where available
        ii. Enforce pick and drop stages
        iii. Discourage violation of traffic regulation such as overlapping and not obeying traffic regulations with stiff penalties
        iv. Any motorist contravening traffic laws should be prosecution
        v. Utilize alternative deterrent measures such as

            -suspension of licenses of serial offenders

            -detention at road side for stipulated period of time

    b. Road users particularly pedestrians may be ignorant of traffic laws and regulations
        i. Educate pedestrians and then strictly enforce of traffic regulations.
        ii. Sensitize and enforce a widely distributedHighway Code to all including non-motorized vehicles.
        iii. Driving licenses should be renewed every ten years and before renewal;
            - drivers must undertake a refresher course on the highway code
            - there should be a mandatory eye test at a designated age (65 years)

iv. Re-train traffic police officers\marshals to man the major roads and ensure adherence to traffic laws.

v. The National Transport and Safety Authority (NTSA) should develop a testing curriculum for drivers to be implemented through testing centers devolved to the county

vi. Develop and enforce a code of conduct for all public service vehicles.

vii. All PSV licensees should use the officially gazetted termini and routes in the City.

c. There is corruption of road users and enforcement officers

i. Automate enforcement of laws and thus remove the human factor that facilitates corruption

ii. Avail traffic police/marshalswith motor cycles that move along the roads to ensure enforcement

iii. Use electronic control systems to inform on signage and traffic offenders

iv. Use aerial surveillance for traffic trends and offenders

v. Repossess grabbed road reserves for road expansion without prejudice.

vi. Clear road reserves of all kiosks and illegal businesses

vii. Engage citizens and incentivize them to police and report corrupt enforcers and road users through an effective whistle blowing system

5. Regarding the scheduling of work and schools timing, the following were observed and recommended:

a. There is increased traffic congestion during the school term for the schedules for scholars and workers are similar

    i. Control school transport system by zoning, increased provision of schools in zones and.

    i. Develop and enforce a zoning school policy in the city withrestriction of student admission to areas of residence

    ii. Change school hours to start later at 9 am instead of 8 am

    iii. Stagger business working hours so that people are not too crowded at one point at a particular time.

6. Regarding land use policy and planning, the following were the observations and recommendations;

    a. There is a concentration of services in the city centre

        i. Develop centers such as markets, bus termini and shopping malls as the periphery trading centers so as to attract business and avert vehicles and human beings from coming into the CBD.

        ii. Decentralize essential services such as licensing from the city centre to the other areas.

        iii. Relocate government offices should from the CBD.

        iv. The Nairobi City County should make arrangements for their City Inspectorate staff to work 24 hours a day.

v. Encourage a 24 hour economy to encourage accessing services at off peak hours

vi. Enhance security within the CBD by removing street families

b. There is no comprehensive urban transport policy

i. Develop or update and implement a stakeholder owned Nairobi specific comprehensive and futuristic urban transportation master plan through an evidence based and multidisciplinary approach.

ii. Create awareness and disseminate the master plan and ensure enforcement

c. There is a shortage of accurate and adequate traffic data

i. Continually collect data to monitor performance of systems and proactively plan and provide updates for the future needs of the projected population of the City

7. Regarding signage, automation and centralized electronic control, the following are the observations and recommendation:

a. There is poor synchronization and signage of the traffic system

i. Implement an Intelligence Transport Management System (ITMS) and a traffic management system

ii. Reduce the human factor and increase the use of technology for detection of traffic flow for timing of traffic lights, enforcement purposes and priority passage of emergency vehicles with unique identifiers.

b. The traffic centre for data to inform signage and is not controlled by the County
    i. Segregate elements of security enforcement by the police and those of demand and supply in respect to timing and synchronizing traffic lights by a county operated Transport Management Control
    ii. Use the control centre to collect accurate and adequate data on traffic to make evidence based decisions
    iii. Automate traffic lights using information from the control centre.
    iv. Permit security access for information sharing and police enforcement purposes
c. The parking charging system is currently manual
    i. Mount automated parking meters at all parking bays.
    ii. Remove the human factor from all payment of fines by use of automated/electronic systems.

8. Regarding the legal mandate for efficient decongestion, the following are the observations and recommendations;
    a. There are many government agencies important for implementation of city decongestions
        i. Ensure there are clear mandates of various state agencies involved in traffic such as NTSA, KeNHA, KURA, and KeRRAetc.
        ii. Form a single authority to manage transport held entirely accountable for decongestions.

iii. Include the national government, Nairobi County City as well as Nairobi metropolitan adjacent counties such as Kiambu, Kajiado and Machakos in authority.

iv. Include various stakeholders in the industry and experts in transport management in the authority.

v. Enact laws to empower the agency with the requisite development and enforcement of mandate.

vi. Enact and encompass all relevant legislation and policies in respect to access, zoning, tolling and parking as well as develop effective framework and strategies for implementation and enforcement.

vii. Streamline licensing between the various agencies e.g. NTSA vis a vis Nairobi City County.

9. Regarding implementation of decongestion plans, the following are the observations and recommendations;

    a. There have been many plans and very little implementation.

    b. Lack of timely implementation leads to obsolete recommendations and need for more studies, task forces and harmonization

        i. Initiate action on implementation of the solutions that have repeatedly been identified in studies carried out previously.

        ii. Prioritize decongestion and allocate adequate funds for implementation of plans

iii. Funding of the urban transport system should be through levies on use, access; innovative methods of PPP.

iii. Lobby for increased funding of transport projects by the central government, Nairobi City County as well as the adjacent counties of Machakos, Kiambu and Kajiado.

The suggestions for mitigation of congestion must include investment in an efficient mass rapid public transportation. After this, COE, ERP, road space rationing, congestion, high parking charges, park and ride facilitiesand other strategies should be encouraged with the intentionof encouraging people to use public transport instead of driving. This strategywill only be useful where there is a safe, reliable and mass transport system.

The committee identifies these as recommendations that could provide quick wins regarding traffic congestion. These will have immediate benefits to decongest the city.

1. Strict enforcement of route licenses.
2. Restriction of cargo deliveries to night hours or the weekends in the CBD.
3. Reorganization of taxis through zoning encouraging circulation rather than parking.
4. Designating bodaboda and tuktuk zones and the banning of motor bikes carrying passengers in the city centre.
5. Strict enforcement of the use of foot bridges where available.
6. Strict enforcement of pick up and drop off stages.

7. Strict enforcement of the traffic rules and regulations discouraging overlapping and the introduction of stiffer penalties for disobedience of the traffic rules.
8. Educate pedestrians and sensitize them on the need for using designated pedestrian crossing points, then strictly fine and enforce the traffic rules.
9. Sensitize and enforce the Highway Code as it applies to non-motorized vehicles such as hand carts and bicycles.
10. Roll out highly trained police officers/traffic marshals to man the major roads and ensure adherence to traffic laws.
11. Ensure that all PSV operators, whether in companies or SACCO's, use the officially gazetted termini and routes in the city.
12. Clear all road reserves of kiosks and illegal businesses.
13. Ensure that the Nairobi City County's Inspectorate staff work 24 hours a day.
14. Remove street families within the CBD to enhance security and improve traffic flow.

These recommendations are in sync with best practices for urban traffic decongestion worldwide. Irrespective of the city decongestion entails the development of an efficient and reliable state owned mass transport system, be it bus, tram, light rail and/or metro that limits access of privately operated low and medium capacity transport vehicles into the city by;.

a. zoning, tolling and congestion pricing
b. heavy parking charges per hour
c. designated lanes - slow lanes for vehicles with few passengers

d. safe park and pay stations at the periphery of the city

In addition, transit traffic is diverted through by passes and outer ring roads and re-designing and reconfiguration of interchanges and other traffic flow strategies that maximize the use of the available infrastructure. Last but not least, is the usage of electronic systems for road pricing, parking and monitoring violations as well as enforcing traffic regulations by heavy fines. With available mass transport systems, congestion pricing which uses the power of the market to reduce discretionary rush hour highway private traffic encouraging use of public transport or off-peak travel isthe single most viable and sustainable approach to reducing traffic congestion.

The decongestion vision of Nairobians is exemplified by one respondent who concluded his submission as follows:

> I *remain, Sirs and Ladies, your faithful citizen who loses 1-2 hours every day in traffic, wasting time and money, choking on fumes and fighting with matatus. I would rather walk down a safe, well-lit sidewalk to my neighborhood transit stop and read my book while I ride the metro to work! Who wouldn't?*

IMPLEMENTATION

The Transport and Urban Decongestion Committee (TUDC) was mandated to collect views of people in Nairobi regarding the causes, effects and possible solutions regarding traffic in the City County. Having presented the interim report to the Governor, one of the recommendations of the Cabinet was that the committee provides an implementation framework with clear timelines and player to facilitate operationalization of the recommendations.

One of the keynote recommendations is the setting up of a Nairobi City County Transport Authority (NCCTA), which would handle all matters to do with transport within the County, including transport and traffic management systems as ultimately decided on by the County.It is intended that the Nairobi City County Transport Authority will be the body that deals with all matters of transport in the County.

This will require a bill for consideration in the County assembly and it is envisaged that the authority should be functional by June 2015.

Furthermore, there will be need to devolve certain powers and functions; especially those of KURA and KERRA, to enable the County effectively discharge its mandate especially with regards to the management of transport.In this regard, it is this committee's proposal that a consultative meeting be set up with the national government to determine the functions, powers and resources critical to the implementation of the report to be devolved as a matter of priority.

These discussions will then form the base from which the proposed authority and the county government can then effectively operate in terms of decongesting the city.

The committee noted that there is lack of discipline on city roads and identified specific issues and solutions as per the views of Nairobians.

The committee noted that solutions to the challenges of indiscipline, ethics and compliance which require educating of stakeholders and the public, enactment and enforcement of the relevant laws.

The committee noted from public views collected, that corruption is a major challenge within the transport sector. The suggested solutions to deal with corruption require innovative systems.In addition, it requires innovative ideas that will include not just public sector organizations but also those in the private sector, the civil society and all people of good will who are committed to eliminate the vice of corruption that is deeply entrenched in our society.

It is also noted that in trying to implement the committee's report, invariably there must be consultations with all persons who will be affectedby this report. The committee is happy to report that consultations were undertaken with the relevant sector committee in the county assembly who lauded the committee for the work it has hitherto undertaken. In addition the interim report was presented to stakeholders at a forum facilitated by KARA and their views incorporated.

Similar consultations with other stakeholders like the National Transport and Safety Agency (NTSA), Kenya Railways, the Ministry of Transport and Infrastructure, the police, the EACC among others, need to be undertaken in order to enable implementation of the recommendations and facilitate efficient service provision by both the national and county governments.

The committee considered the implementation of the recommendations in two aspects; the first is infrastructure and the second ethics and compliance. Recognizing the County government has numerous commitments and implementation requires planning within given timelines, the committee recommends the following short, medium and long-term interventions (within 1 year, 1-5 years and over 5 years respectively).Furthermore, the committee recognized that various actors in the public and private sectors need to work together and there may be a need for laws to operationalize the recommendations.

INFRASTRUCTURE IMPLEMENTATION MATRIX

S/no	Interventions	Legal position	Timeline (months)	Actors
SHORT TERM INTERVENTIONS				
1.	Data Collection	Law	Continuous	• NCC
2.	Enhancement of security	Law	6	• NCC
3.	Educate/Create Public Awareness	Law	7	• NCC • NTSA
4.	Introduction of timed parking	Law	8	• NCC

5.	Minor junction improvements including reduction of size/number of roundabouts	Law	9	• NCC
6.	Deployment of Traffic Marshals	Law	10	• NCC
7.	Review of institutional structure and legal Frame work within the County	Need Law	12	• NCC
8.	Review the designation of PSV termini, routing and Gazette	Law	12	• NCC
9.	Routine maintenance of roads including removal of encroachments	Law	12	• NCC • KURA
10.	Introduction of diametric routing	Law	12	• NCC • NTSA
11.	Introduction of regulations (County Traffic Management Act)	Need Law	12	• NCC
12.	Enforcement using IT e.g. CCTV cameras	Law	12	• NCC • MOT
13.	Synchronization of Traffic signals	Law	12	• NCC
14.	Introduction of High capacity PSV's	Law	12	• NCC
15.	Creation of dedicated lanes for high capacity for PSVs and Emergency vehicles	Law	12	• NCC
o MEDIUM TERM INTERVENTIONS				
- -	**Interventions**	**Legal position**	**Timeline (years)**	**Actors**
16.	Construction footbridges and walkways across major transport corridor to enhance pedestrian safety	Law	2	• NCC • KeNHA

17.	Moderate junction improvements as well as conversion of streets into one way	Law	2	• NCC • KeNHA
18.	Review the institutional structure and legal frame work for the transport industry	Need Law	2	• NCC • MOT
19.	Review of Training Curriculum for Drivers and introduction of new driving licenses	Need Law	2	• MOT • NTSA
20.	Review of land use policy	Need Law	2	• NCC
21.	Introducing a dedicated fund fortransport for both the county and national government to attract donor funding and PPPs	Need Law	2	• NCC • MOT
22.	Construction of termini outside the CBD and within the Sub-Counties	Law	3	• NCC
23.	Redesigning, dual ling of major transport corridors and expanding the feeder roads	Law	3	• KeNHA
24.	Erect street lighting along the roads	Law	3	• NCC • KeNHA
25.	Enhancement of road safety through awareness, installation of road furniture and enforcement	Law	3	• NCC • KeNHA
26.	Create arterial movement around the County	Law	4	• NCC • KeNHA
27.	Construction of a traffic management Centre (TMC)	Law	5	• NCC
28.	Introduction of the integrated transport system	Law	5	• NCC
LONG TERM INTERVENTIONS				

	Interventions	Legal position	Timeline (years)	Action
32	Construction of Parking silos	Law	5	• NCC
34	Introduction of Mass Rapid Transport System	Law	5	• NCC • KeNHA
35	Construction of transport hub(s) within the County e.g. Muthurwa	Law	5	• NCC • MOT
36	Construction of MRTS infrastructure	Law	5	• NCC • KeNHA
38	Introduction of congestion pricing	Need Law	5	• NCC • MOT
30	Major junctions improvements	Law	6	• NCC • KeNHA
31	Construction of By-passes	Law	6	• KeNHA
33	Construction of elevated roads	Law	6	• KeNHA
37	Introduction of an intelligent transport system (ITS) in the County	Law	7	• NCC • MOT

ETHICS AND COMPLIANCE IMPLEMETATION MATRIX

SHORT TERM INTERVENTIONS				
	Intervention	**Legal position**	**Timeline (months)**	**Actors**
1.	Engage citizens and incentivize to police and report corrupt enforcers through and effective whistle blowing systems.	Law	Continuous	• NCC • EACC

2.	Enforce use of foot bridges where available: public campaign in the yearly calendar School curriculum insurance companies through accident & health policies Consideration must also be given for the disabled – construction of ramps and possibly lifts. Security – use of cameras and Askaris	law	2	• NCC • MOEducation • AKI • NCEC • National Police Service
3.	Enforcement of traffic regulations sensitization of the public on traffic rules Public campaign in the yearly calendar	Law	2	• NCC
4.	Sensitize & enforce the Highway code to all including non-motorized transport. Public campaign in the yearly calendar School curriculum The Highway Code Book should be widely distributed.	Law	2	• NCC • MOEducation
5.	Re train police officers/marshals to man the major roads and ensure adherence to traffic laws		6 Continuous	• National police service • NCC
6.	Develop and enforce a code of conduct for all public service vehicles.	Need regulations	6	· NTSA · driving schools · traffic department

				· SACCOs ● MOA ● MWA
7.	The National Transport and Safety Authority should develop a testing curriculum for drivers through testing centers approved by the county		12	● NTSA ● driving schools ● traffic department ● SACCOs
8.	Clear road reserves of all kiosks and illegal businesses	By law	12	● NCC
MEDIUM TERM INTERVENTIONS				
	Intervention	**Legal position**	**Timeline (years)**	**Actors**
9.	All PSV licensees should use the officially gazetted termini and routes in the City.	Law	1. 1/2	● Crew ● passengers ● SACCOs ● MOA/MWA
10.	Repossess grabbed road reserves for road expansion	By law	1. 1/2	● NCC ● Transport ● EACC ● Chiefs
11.	Enforce & drop stages CCTV – Secure drop stages Both crew and passengers to be held responsible for compliance –	Law	2	● SACCOS ● driving schools ● NCC
12.	Discourage violation of traffic regulation such as overlapping and not obeying traffic regulations with stiff penalties Undercover agents to document violators e.g. “shame	Law	2	● NCC ● NTSA ● MOT ● KRA ● NGO initiatives ● National Police service

	on you", Citizen media already have in place "Road Hog" Partners e.g. "Ungwana/Ushenzi initiative Use of CCTV, TV, Traffic police on motorcycles,			
13.	Driving licenses should be renewed every ten years and before renewal drivers must undertake a refresher course on the highway code. At a designated age (65 years) it should be mandatory to have an eye test prior to renewal of driving license.	Need law	2	• Traffic department • MOHealth
14.	Automate enforcement of laws and thus remove the human factor that facilitates corruption. Intelligence/undercover agents to document violators e.g. "shame on you", Use of CCTV, TV, Phone camera Motivation for passenger and other road users to document Partners e.g. "Ungwana/Ushenzi initiative	Law Need law	2	• National Police service • NCC • NGOs • Citizens/consumer organisations e.g. KARA. organizations • volunteer • KRA
15.	Avail traffic police/marshals with motor cycles that move along the roads to ensure enforcement.	Laws /by law	2 Continuous	• NCC • volunteers
16.	Use electronic control systems to inform on signage and traffic offenders.	law	2	• NCC
17.	Any motorist contravening traffic laws should be prosecuted.		3	• NCC • NTSA • Ministry

	Utilize alternative deterrent measures such as suspension of licenses of serial offenders and or detention at road side for stipulated period of time	Need a law		• KRA • NGO initiatives • National Police service
18.	Use aerial surveillance to inform traffic trends and offenders	-	3	• NCC

ANNEXURE 1

Remarks by HE the Governor – Dr Evans Kidero

Ladies and gentlemen, Nairobi City County has been in existence for the last 11 months. During this period we have made great strides some of which include setting up of CCTV cameras at different points to improve security and capture traffic violators, we have also partnered with members of the private sector and formed the Nairobi City County Public Private Partnership – Roads, Public Works, Infrastructure and Transport Transformation Taskforces that has adopted certain projects including the setting up of a dog unit to enhance security within the county and the construction of a Disaster Management Centre to enhance the County's ability to manage disasters as and when they occur.

During this period we have also faced numerous challenges key of which is dealing with the issue of congestion on the county roads and restoring the sanity in the Public Service Industry.It is against this background that I have decided to constitute this committee to comprehensively address the issue. The committee shall collect and receive views from relevant stakeholders in all the 17 constituencies and seek expertise from specialist agencies or individuals.

The Committee's Terms of Reference include among other things;

- Develop recommendations that will address current projected traffic congestion
- Carry out route by route verification and validation of the illegal stages or recommend the way forward
- Determine current traffic conditions and needs over the extent of the project area
- Formulate and develop a Transport Policy for the Nairobi City County
- Identify and recommend on how to deal with private taxis which occupy 40% of all parking space in the CBD

Ladies and Gentlemen congratulations for your appointment to this committee. This committee is very critical in terms of enforcing my government's objective to decongest Nairobi CBD, in particular and Nairobi County generally. I watch news and receive complaints and 60% of the

complaints revolve around congestion in the city. We cannot manage this mega city in a haphazard manner. Congestion affects our economy in several ways; it consumes a lot of fuel and pollutes and pollutes our environment. This committee should identify:

a) Quick wins that can be implemented immediately to ameliorate the problem
b) Medium terms recommendations to be implemented an interim report
c) Long term recommendations on a comprehensive and holistic approach on how to resolve the issue of congestion
d) The committee should also examine the issue of parking and taxis in the CBD and make recommendation

The Nairobi City County is ready to work with you and assist you to overcome any challenges we urge the public to submit their views and proposals to you.

I wish you success. Thank you

ANNEXURE 2
GAZETTE NOTICE

ANNEXURE 3

PUBLIC HEARING NOTICE AND ADVERTISEMENT IN THE DAILY NATION

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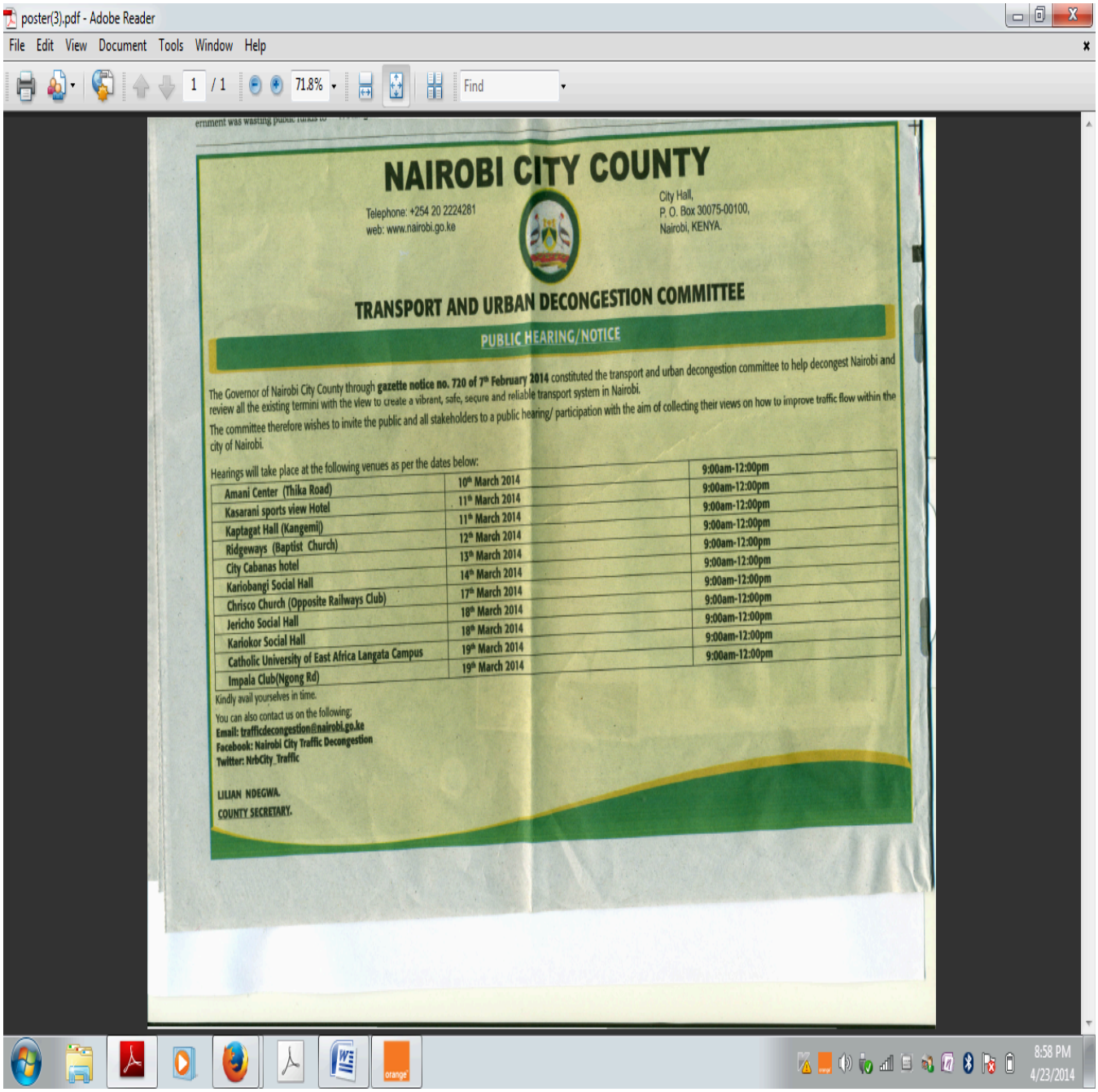
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City Hall,
P. O. Box 30075-00100,
Nairobi, KENYA.
TRANSPORT AND URBAN DECONGESTION COMMITTEE
PUBLIC HEARING/NOTICE
The Governor of Nairobi City County through gazette notice no. 720 of 7th February 2014 constituted the transport and urban decongestion committee to help decongest Nairobi and review all the existing termini with the view to create a vibrant, safe, secure and reliable transport system in Nairobi.
The committee therefore wishes to invite the public and all stakeholders to a public hearing/ participation with the aim of collecting their views on how to improve traffic flow within the city of Nairobi.
Hearings will take place at the following venues as per the dates below:
Amani Center (Thika Road) 10th March 2014 9:00am-12:00pm
Kasarani sports view Hotel 11th March 2014 9:00am-12:00pm
Kaptagat Hall (Kangemi) 11th March 2014 9:00am-12:00pm
Ridgeways (Baptist Church) 12th March 2014 9:00am-12:00pm
City Cabanas hotel 13th March 2014 9:00am-12:00pm
Kariobangi Social Hall 14th March 2014 9:00am-12:00pm
Chrisco Church (Opposite Railways Club) 17th March 2014 9:00am-12:00pm
Jericho Social Hall 18th March 2014 9:00am-12:00pm
Kariokor Social Hall 18th March 2014 9:00am-12:00pm
Catholic University of East Africa Langata Campus 19th March 2014 9:00am-12:00pm
Impala Club(Ngong Rd) 19th March 2014
Kindly avail yourselves in time.
You can also contact us on the following:
Email: trafficdecongestion@nairobi.go.ke
Facebook: Nairobi City Traffic Decongestion
Twitter: NrbCity_Traffic
LILIAN NDEGWA.
COUNTY SECRETARY.
8:58 PM
4/23/2014

ANNEXURE 4

QUESTIONNAIRE

NAIROBI COUNTY TRANSPORT URBAN AND DECONGESTION COMMITTEE QUESTIONNAIRE

As a Nairobian, you are a stakeholder in the traffic situation in the city and we would like to ask you a few questions regarding your views on the state of traffic congestion and possible solutions. These will be important as the County plans to decongest the traffic in the City.

Kindly answer by circling your preferred answers or write where space is provided.

Personal information

1. **Age** under 21, 21-30, 31-40 41-50 51-60 over 60
2. **Sex** male female
3. **Stakeholder status**

   student employee businessman/woman formal trader informal trader transport sector, matatu crew

4. **Where do you live?**

   ---

5. **How long have you lived in Nairobi?**

   less than 5 years 5-10 yrs 11-15 yrs 16-20 yrs 21-25 yrs
   26-30 yrs 31-35 yrs 36-40 yrs over 40 yrs

Questionnaire

1. **Does Nairobi have a traffic congestion problem?** yes no
2. **Why?**

   ---

3. **In a week, how many times do you go to the CBD?**

   one two three four five six seven more than seven (indicate)

4. **How do you get into the CBD?**

   heavy commercial vehicle own car matatu Mini bus railway walk

5. **Through what road do you access the CBD?**

Mombasa rd Langata rd Ngong rd valley rd Waiyaki way Limuru rd Kiambu rd Thika rd Juja rd Jogoo rd

6. **How long does it take you to get to the CBD on a work day?**

less than 30 mins 30 min - 1 Hr 1-1 ½ hrs 1 ½ - 2 hrs 2 - 3 hrs over 3 hrs

7. **How long does it take you to get to the CBD on a public holiday or a Sunday?**

less than 30 mins 30 min - 1 Hr 1-1 ½ hrs 1 ½ - 2 hrs 2 - 3 hrs over 3 hrs

8. **If you leave home at 5 am, where does the traffic congestion start? (area). How long does it take?**

---

9. **If you leave home at 6 am, where does the traffic congestion start? (area)How long does it take?**

---

10. **If you leave home at 7 am, where does the traffic congestion start? (area)How long does it take?**

---

11. **If you leave home at 8 am, where does the traffic congestion start? (area)How long does it take?**

---

12. **On a scale of 1-5 (least to most responsible) who is responsible for the traffic congestion?**

Heavy commercial vehiclespersonal carsmatatus minibus motorbikes mkokoteni pedestrians

13. **Why do you consider your choice the most responsible?**

---

14. **Where available, do pedestrians use the pedestrian (zebra) crossing?**

all of the times most of the time sometimes rarely never

15. **Where available, do pedestrians use foot bridges?**

all of the times most of the time sometimes rarely never

16. Why do you think pedestrians don't utilize these facilities?

---

17. Do motorists stop to let pedestrians cross at designated crossings?

all of the times most of the time sometimes rarely never

18. Do public transport vehicles (matatus and minibuses) respect designated places (stops and stages) to drop and pick passengers?

all of the times most of the time sometimes rarely never

19. Do motorists obey traffic lights?

all of the times most of the time sometimes rarely never

20. On a scale of 1-5 (least to most) who obey traffic lights?

Heavy commercial vehicles personal cars matatus minibus motorbikes mkokoteni pedestrians

21. Do motorists obey traffic police or traffic marshals?

all of the times most of the time sometimes rarely never

22. Do you consider road users disciplined? yes No

23. On a scale of 1-5 (least to most disciplined) how do you rate the various road users?

Heavy commercial vehicles personal cars matatus minibus motorbikes mkokoteni pedestrians

24. What is the cause of indiscipline on our roads?

---

25. How can discipline be increased?

---

26. Do police have a role in traffic congestion? yes no

27. Which role?

---

28. How would you rate the state of the roads you utilize?

Excellent Very good good poor very poor

29. What can be done to improve the road you use in the short run?

---

30. What can be done to improve the road you use in the long run?

---

31. Have you ever used the railway service into town? yes No

32. **Do you consider the train service a solution to the traffic congestion?** yes No

33. Why?

---

34. Give three things that can be done to decongest the city in the short run.

---

35. Give three things that can be done to decongest the city in the long run.

Is there any other thing that you would like to tell the committee in respect to the traffic congestion in the city of Nairobi?

Thank you for your views.

They will be useful in alleviating traffic congestion in Nairobi.

ANNEXURE 5

INDEPTH INTERVIEW GUIDE FOR EXPERTS AND ORGANISATIONS

Introduce yourself and present your identification

Request for submission as follows:

"The Transport and Urban Decongestion Committee was launched by H.E the Governor on 27th January 2014 to collect vies from the public on how to help decongest Nairobi City County.

We have identified you as important, expert or leader in an organization such as an association or regulator with specific insights that could help decongest Nairobi. We value your input and we invite you to submit your written or oral submission in the following areas

1) What is the cause of congestion
2) What are the effect of congestion
3) What are solutions to address congestion in the Nairobi City County road network in terms of;
    a. short terms
    b. medium term
    c. long terms

We appreciate your views and assure you that we shall consider them to inform our report.

Thank you"

ANNEXURE 6

KENYA BUS SERVICES LIMITED

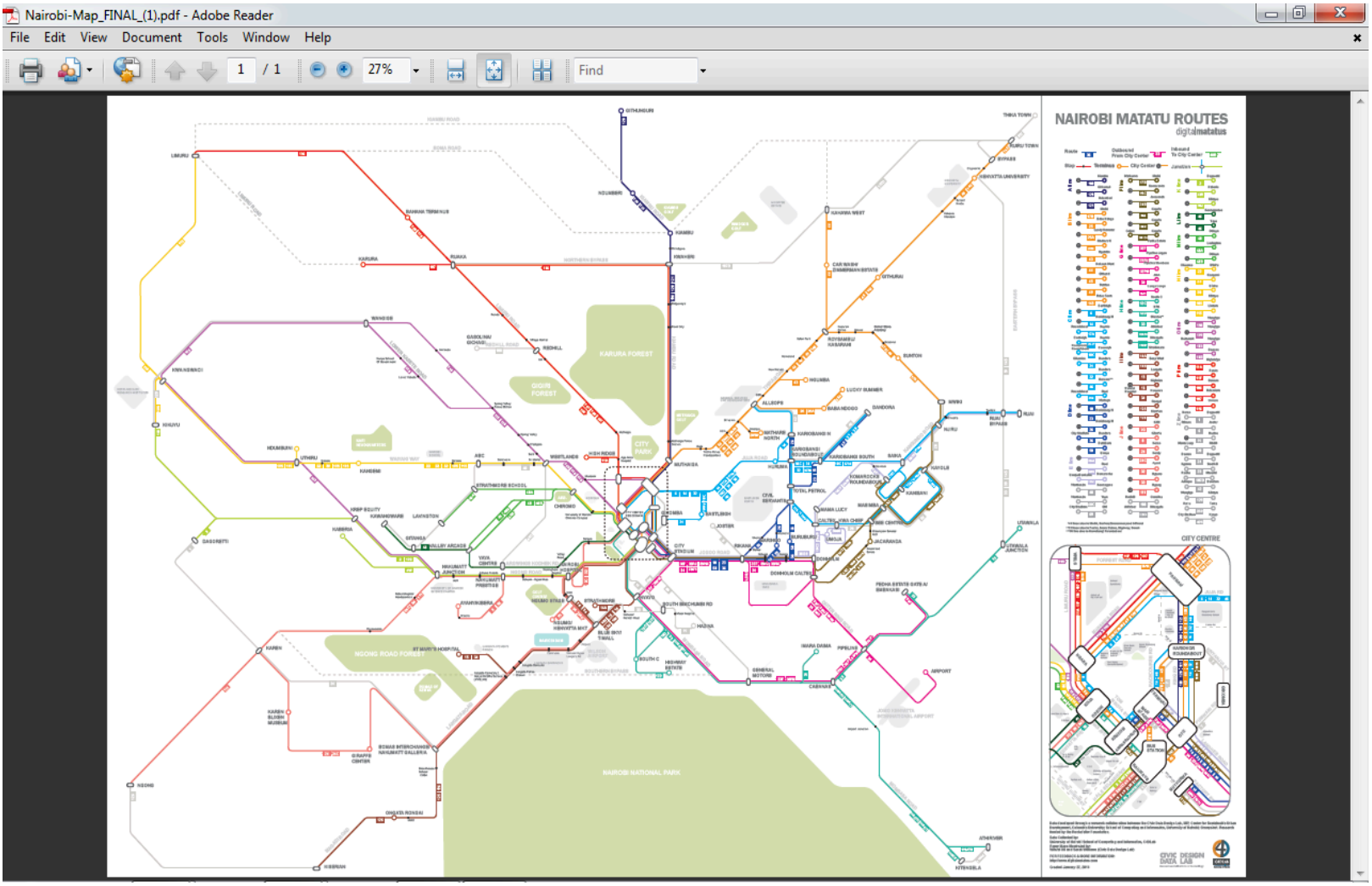
NAIROBI BUS GUIDE :

Routes that were once operated by Kenya Bus Service Ltd

ROUTE NUMBER.	Route Type	DEFINATION OF ROUTES	NO.OF BUS	JOURNEY TIME	AVG. SPEED	FREQ	KMS	REMARKS
1	Peri-Urban	BUS STATION-COMMUNITY-DAGORETTI CORNER-KAREN-DAGORETTI MARKET	14	70	0.3	5	22.0	Not operated
2	Peri-Urban	BUS STATION-COMMUNITY-DAGORETTI CORNER-WAITHAKA-DAGORETTI MARKET	7	70	0.3	10	19.4	Not operated
3	Peri-Urban	EASTLEIGH SEC. 3-SHAURI MOYO-GIKOMBA-KARIOKOR-CITY-DAGORETTI CORNER-KABETE DUKAS-KIN	8	80	0.3	10	25.7	Not operated
4	Intra-Urban	EASTLEIGH SEC. 3-KARIOKOR-CITY-RIRUTA SATELLITE	6	60	0.3	10	16.7	Operated
5	Urban	BUS STATION-COMMUNITY-ADAMS ARCADE-JAMHURI ESTATE	6	60	0.2	10	9.7	Not operated
7	Urban	JERICHO-BAHATI MLANGO-SHAURI MOYO-PUMWANI-GIKOMBA-CITY-K.N. HOSPITAL	6	60	0.2	10	11.9	Operated
8B	Urban	KIBERA-CITY-PUMWANI SOCIAL HALL-GENERAL WARUINGI STREET-JERUSALEM-JERICHO	6	60	0.3	10	16.7	Operated
10	Urban	KHALSA-RONALD NGALA-RIVER ROAD-KOINANGE ST-PARLIAMENT ROAD-HAILE SRLASSIE AVENUE - H	3	30	0.3	10	16.7	Not operated
10A	Urban	ST. PETERS-HAILE SELASSIE- MOI AVE-HARAMBEE AVE-TAIFA RD-GPO-UHURU HIGHWAY-UNIVERSITY	3	30	0.3	10	16.7	Not operated
11	Urban	SOUTH B-CITY-PARKLANDS	7	70	0.2	10	12.0	Not operated
12	Urban	SOUTH B-CITY-HIGHRIDGE	7	70	0.2	10	12.0	Not operated
13	Intra-Urban	KARIOBANGI-HURUMA-JUJA RD-CITY-MBAGATHI ROAD-OTIENDE	8	80	0.3	10	26.0	Not operated
14	Intra-Urban	KARIOBANGI-HURUMA-JUJA RD-CITY-NAIROBI WEST-OTIENDE	8	80	0.3	10	21.4	Not operated
15	Urban	KARIOBANGI-HURUMA-JUJA RD-CITY-NAIROBI WEST-OTIENDE	8	80	0.3	10	21.4	Not operated
17		BUS STATION-JUJA RD-KANGUNDO RD-NJIRU-KASARANI	7	70	0.3	10	21.3	Not operated
17B		BUS STATION-THIKA RD-MUTHAIGA ROUNDABOUT-MWIKI	7	70	0.2	10	17.1	Not operated
18		KENYATTA N. HOSPITAL-BUS STATION-PUMWANI-JUJA RD.-UMOJA II-KAYOLE	8	80	0.3	10	23.7	Operated
19		BUS STATION-JOGOO RD.-UMOJA CALTEX-KOMAROCK	7	70	0.2	10	15.7	Operated
20		KENYATTA N. HOSPITAL-BUS STATION-JUJA RD.-UMOJA-KAYOLE-NJIRU-KASARANI	8	80	0.3	10	26.1	Not operated
22		OUTERRING RD. ESTATE-JERUSALEM-JOGOO RD.-CITY-WESTLANDS-KANGEMI-KABETE DUKAS-CAMPU	8	80	0.3	10	25.8	Not operated
23		OUTERRING RD. ESTATE-JERUSALEM-JOGOO RD.-CITY-WESTLANDS-KANGEMI	8	80	0.2	10	19.8	Operated
24		BUS STATION-NAIROBI WEST-LANGATA-BOMAS-HARDY-KAREN	8	80	0.3	10	25.9	Operated
25		BABA DOGO-G.S.U.ROUND ABOUTMUTHAIGA-PANGANI-CITY-KENYATTA N. HOSPITAL	8	80	0.2	10	14.2	Operated
26		KARIOBANGI-MUTARAKWA RD-KARIOBANGI SOUTH-JERUSALEM-STADIUM-CITY-KENYATTA N. HOSPITA	7	70	0.2	10	17.0	Not operated
27		KARIOBANGI-G.S.U.ROUND ABOUT-PANGANI-CITY-ADAMS ARCADE-RIRUTA SATELLITE	7	70	0.3	10	20.8	Not operated
28		KARIOBANGI-JUJA RD.-PUMWANI-GIKOMBA-CITY-KIBERA OLYMPIC	7	70	0.3	10	18.6	Operated
29		MATHARE NORTH-THIKA RD-PANGANI-CITY-WESTLANDS-KABETE DUKAS-KINOO	9	90	0.3	10	29.5	Not operated
30		KINOO-KABETE DUKAS-WESTLANDS-CITY-KARIOKOR-JUJA RD-MATHARE NORTH	9	90	0.3	10	25.9	Not operated
31		KARIOBANGI-HURUMA-JUJA RD-KARIOKOR-CITY-NAIROBI WEST-OTIENDE	8	80	0.3	10	21.4	Not operated
32		DANDORA ESTATE-JUJA RD.-KARIOKOR-CITY-KIBERA AYANY ESTATE	8	80	0.3	10	21.2	Operated
33		EMBAKASI VILLAGE-JOGOO RD.-CITY-K.N HOSPITAL-MBAGATHI WAY-OTIENDE	9	90	0.4	10	34.0	Not operated
34		JKI AIRPORT-JOGOO RD.-CITY-K.N HOSPITAL-MBAGATHI WAY-OTIENDE	9	90	0.4	10	33.2	Operated
35		DANDORA-KARIOBANGI SOUTH-OUTERING RD-JOGOO RD.-CITY STADIUM	6	60	0.2	10	12.1	Not operated
36		DANDORA-KARIOBANGI SOUTH-BURUBURU-JOGOO RD.-CITY-NGUMMO ESTATE	7	70	0.3	10	21.7	Operated
37		DANDORA-KARIOBANGI SOUTH-JERUSALEM-JOGOO RD.-CITY-NGUMMO ESTATE	7	70	0.3	10	20.7	Operated
38		BUS STATION-JUJA RD-KANGUNDO RD-NJIRU-RUAI	9	90	0.3	10	28.1	Not operated
39		BUS STATION-JOGOO RD-KANGUNDO RD-NJIRU-RUAI	9	90	0.3	10	26.3	Operated
40		KARIOBANGI-JUJA RD.-KARIOKOR-CITY-NGUMMO ESTATE	7	70	0.2	10	15.1	Operated
41		DANDORA ESTATE-JUJA RD.-PUMWANI-GIKOMBA-CITY-NGUMMO ESTATE	8	80	0.2	10	19.5	Operated
42		DANDORA ESTATE-JUJA RD.-KARIOKOR-CITY-KIBERA AYANY ESTATE	8	80	0.2	10	19.9	Operated
42B		DANDORA ESTATE-THIKA RD.-KARIOKOR-CITY-KIBERA AYANY ESTATE	9	90	0.3	10	24.4	Operated
43		KAHAWA WEST-ZIMMERMAN-ROYSAMBU-G.S.U-PANGANI-BUS STATION	8	80	0.2	10	18.6	Not operated
44		KAHAWA WEST-ZIMMERMAN-ROYSAMBU-G.S.U-PANGANI-BUS STATION	8	80	0.2	10	18.6	Not operated
45		KENYATTA UNIVERSITY-GITHURAI-ROYSAMBU-G.S.U-PANGANI-BUS STATION	8	80	0.2	10	15.0	Not operated
46		HURUMA ESTATE-JUJA RD.-KARIOKOR-CITY-VALLEY RD.-KAWANGWARE	8	80	0.2	10	17.7	Operated
47		CITY-MILIMANI ROAD-YAYA CENTRE-LAVINGTON GREEN	6	60	0.2	10	12.0	Not operated
48		CITY-KOLELESHWA-LAVINGTON GREEN	6	60	2.0	10	12.0	Not operated
50		CITY-WESTLANDS-JAMES GICHURU ROAD-LAVINGTON GREEN	6	60	0.2	10	12.0	Not operated
52		DANDORA-JUJA RD-KARIOKOR-CITY-WESTLANDS-KANGEMI	8	80	0.3	10	23.3	Not operated
53		MATHARE NORTH-M.A.B. GATES-K.B.S. DEPOT-GIKOMBA-CITY-COMMUNITY-NGUMMO	7	70	0.2	10	15.1	Not operated
59		KENYATTA N. HOSPITAL-CITY-JOGOO RD-NILE RD-RABAI RD-BURU BURU-UMOJA I	7	70	0.2	10	16.6	Not operated
60		UMOJA II-DONHOLM-CITY STADIUM-CITY-COMMUNITY-KIBERA	8	80	0.3	10	21.9	Not operated
61		KAYOLE-UMOJA II-DONHOLM-CITY STADIUM-CITY-COMMUNITY-KIBERA	9	90	0.3	10	28.3	Not operated
61B		KENYATTA N. HOSPITAL-CITY - JOGOO RD. - UMOJA II - SOWETO - KAYOLE	8	80	0.3	10	22.1	Operated
71		INDUSTRIAL AREA	8	80	0.3	10	22.1	Not Operated
100		BUS STATION-PANGANI-MUTHAIGA ROUND ABOUT-KIAMBU RD-KIAMBU INSTITUTE-KIAMBU	5	100	0.5	20	50.0	Not operated
102		BUS STATION-COMMUNITY-DAGORETTI CORNER-WAITHAKA-DAGORETTI CENTRE-KIKUYU	9	90	0.3	10	23.2	Not operated
103		BUS STATION-COMMUNITY-DAGORETTI CORNER-KAWANGWARE-GITARU-WANGIGE	9	90	0.3	10	29.2	Not operated
105		BUS STATION-WESTLANDS-KABETE DUKAS-KINOO-GITARU-WANGIGE	9	90	0.3	10	28.0	Not operated
106		BUS STATION-FIRE STATION-NGARA-GIGIRI-VILLAGE MARKET RUAKA-BANANA	9	90	0.3	10	28.0	Not operated
108		BUS STATION-PANGANI RABOUT-GETRUDE HOSPITAL-GACHIE-KIHARA-WANGIGE	9	90	0.3	10	23.6	Not operated
109		BUS STATION-CITY STADIUM-ENTERPRISE RD.- MOMBASA RD-ATHI RIVER- KITENGELA	9	90	0.4	10	36.1	Operated
110		BUS STATION-CITY STADIUM-LUSAKA RD.- MOMBASA RD-ATHI RIVER-KITENGELA	9	90	0.4	10	36.1	Operated
111		BUS STATION-DAGORETTI CORNER-LENANA- KAREN- NGONG	9	90	0.3	10	24.4	Operated
113		BUS STATION-PARKLANDS-WESTLANDS TRIANGLE-KLA-APPROVED-KINGEERO-WANGIGE	8	80	0.2	10	18.8	Not operated
119		BUS STATION-MUSEUM HILL-WESTLANDS-PEPONI RD.-MWIMUTO-WANGIGE-GIKUNI	8	80	0.3	10	21.2	Not operated
125		BUS STATION-NAIROBI WEST-BOMAS-ONGATA RONGAI	8	80	0.2	10	19.2	Operated
126		BUS STATION-NAIROBI WEST-BOMAS-ONGATA RONGA-KISERIAN-MATASIA	9	90	0.4	10	32.6	Operated
128		BUS STATION-PARKLANDS-WESTLANDS TRIANGLE-KLA-APPROVED-WANGIGE-KIKUYU	9	90	0.3	10	29.0	Not operated
129		BUS STATION-PARKLANDS-WESTLANDS TRIANGLE-MWIMUTO-WANGIGE-KINGEERO-KIKUYU	9	90	0.3	10	27.8	Not operated
146		BUS STATION-PANGANI-ROYSAMBU-GITHURAI-KENYATTA UNIVERSITY-RUIRU	9	90	0.3	10	29.0	Not operated
201		BUS STATION-JUJA RD.-KANGUNDO RD-NJIRU-RUAI-KAMULU-TALA-KANGUNDO	5	150	0.5	30	68.0	Operated
202		BUS STATION-JOGOO RD.-KANGUNDO RD-NJIRU-RUAI-KAMULU-TALA-KANGUNDO	5	150	0.5	30	68.0	Operated
237		BUS STATION-PANGANI-ROYSAMBU-GITHURAI-RUIRU-JUJA-THIKA	5	100	0.5	20	49.0	Not operated
		TOTAL	566	5890	0.3	795	1743.8	

ANNEXURE 7

PUBLIC TRANSPORT ROUTE NETWORK



superimpose the train network vis a vis this picture

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