Investigating for Contributory Factors to Traffic Congestion in Nairobi City, Kenya

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Abstract: *Traffic congestion is a wasteful phenomenon to businesses, society, environment and the economy as a whole. This study analyzed contributory factors to traffic congestion in Nairobi city, Kenya. Identification of study variables relied on theories and principles from welfare economics. Data was collected through questionnaires administered to the city's motorists, interviews with key informants, observations and secondary data sources. Descriptive statistics, mathematical computations and counterfactual analysis were used to analyze the data. Results showed that the city's congestion is due to continuously increasing number of vehicles without effective corresponding long-term congestion management strategies. Its related wastages were estimated as Ksh 146.5 billion and Ksh 16.7 billion annually in terms of delays and wasted fuel respectively. It concludes that management of traffic congestion in the city is not a one-off solution but one that shall involve all the city's stakeholders including undertaking expensive infrastructural projects and revision of various anti-congestion policies. There is also need to cascade such research in other growing towns within the counties to share experiences and develop national statistics on the problem.*

Keywords: Traffic congestion, contributory factors, city, Nairobi, Kenya

1. Introduction

Transport forms a key component of creating a competitive business environment as well as means through which various socio-economic and environmental objectives can be achieved (Nairobi Metro 2030 Strategy). Traffic congestion has frustrated the realization of such objectives in many cities across the world. Congestion prevents us from moving freely and it slows and otherwise disrupts the conduct of business within urban areas.

Congestion has a range of indirect impacts including political and the marginal environmental and resource impacts of congestion, impacts on quality of life, stress, safety as well as impacts on non-vehicular road space users such as the users of sidewalks and road frontage properties (Transport Canada, 2006). In 83 cities across USA the costs of wasted time and fuel due to traffic congestion was estimated (2005) at $60 billion, Jonathan I. Levy, et al (2007). It is predicted that annual economic loss due to traffic congestion will reach $15 billion by 2031 in Canada, Clear Air Commute (2014).

However, though Governments all over the world understand that measuring congestion is a necessary step in order to deliver better congestion outcomes, the subject is shrouded in lots of controversies (Transport Canada, 2006). There is no single, broadly accepted definition of traffic congestion according to Organization for Economic Co-operation and Development (OECD) and European Conference of Transport Ministers (ECMT) report of 2007 including methodology of estimating the related costs and benefits associated with it. This is because traffic congestion is technically about the behaviour of traffic as it nears the physical capacity of the road system and a relative phenomenon relating to user expectations vis-à-vis road system performance – the two cannot be separated in addressing the problem (OECD, 2007).

Nairobi, the capital city of Kenya and also the capital of the Administrative area of Nairobi has the highest urban population in East Africa, estimated at between 3 and 4 million (Wikipedia, 2011).

It is estimated that the vehicle population in Nairobi stands at above 300,000 vehicles in the year 2008 and has been increasing at 5,000 vehicles per month, (Ministry of Roads 2013).

The following government agencies in Table 1 below are involved in road transport in the country and their operations have a direct or indirect impact on traffic congestion in the city:

Table 1: Government Agencies involved in transportation Sector

Government Agency	Mandate
Ministry of Roads.	Charged with the responsibility of providing basic infrastructure facilities to the public. These include development, maintenance and rehabilitation of Road networks in the country.
Ministry of Transport.	Mission is to facilitate safe, efficient, accessible and sustainable transportation services. The Ministry ensures development of regulatory framework, which is enforced through various regulatory bodies. For example, currently the Transport Licensing Board (TLB) established by an Act of Parliament ensures harmony in the provision of road transport services. TLB has the powers to debar vehicles from entering the CBD.
Ministry of Nairobi Metropolitan Development.	Development of integrated Nairobi Metropolitan Areas Growth and Development Strategy covering among other things: integrated roads, bus and rail infrastructure for Metropolitan area, efficient mass transport system for Nairobi metropolitan area. Has developed the Metro 2030 Transport Strategy for the city.

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Ministry of Finance.	The Ministry is charged amongst other functions with the responsibility of formulating financial and economic policies. The Ministry coordinates government ministries/departments in the preparation of the annual national budgets. Ensures that government expenditure is within the revenue collected to reduce domestic borrowing which tends to cause negative ripples in economic management.
Nairobi City Council.	Is charged with the mandate to provide basic services to the community in the city including: water and sanitation; health; education; general infrastructure (roads; security; and employment); and, other economic services.
Kenya National Highways Authority.	A state corporation under the Ministry of Roads. It was set up under the Kenya Roads Act, 2007 and is charged with the mandate to manage, develop, rehabilitate and maintain national roads such as Mombasa Road, Thika Road, Uhuru Highway which are primary link roads to the city's CBD.
Kenya Urban Roads Authority.	Also a state corporation under the Ministry of Roads and established under the Kenya Roads Act, 2007 is mandated with the responsibility for the development, maintenance, rehabilitation and management of urban roads in Kenya including those in Nairobi.
Kenya Traffic Police Department.	The roles of traffic police department amongst others is to prevent road accidents; provision of free flow of traffic along the roads; enforcement of traffic laws and regulations; etc.

(Source: Government of Kenya Reports, 2011)

Traffic jams are a major problem in Nairobi with a debilitating effect on the quality of life of people. Drivers and pedestrians in the city continuously suffer the negative impacts of traffic jams which include delays, lost opportunities, higher costs of living, increased accidents, reduced competitiveness, frustrations and pollution. Transport authorities in Nairobi must manage the problem to acceptable levels for drivers and residents in the city to realize the benefits that come with an effective and efficient transportation system, Irung'u (2007).

The specific objective of the study was to investigate for contributory factors to traffic congestion in the city.

2. Methodology

The study investigated the strategic congestion management principles prescribed by OECD/ECTM (2007) and the Nairobi Metro 2030 Transportation Strategy to determine their level of contribution to traffic congestion in the city of Nairobi. They included:

(i) Coordinating Land Use Planning Policies with Congestion Management Policies
(ii) Building New Road Infrastructure
(iii) Modifying Existing Infrastructure
(iv) Encouraging use of Public Transport

(v) Improving Traffic Operations
(vi) Parking Management
(vii) Adequate Institutional Arrangements in Managing Congestion and
(viii) Congestion Pricing Schemes

2.1 Data Collection

Data on all the eight strategies investigated above was collected through interviewing key informants at the Nairobi City Council; Ministry of Roads; Ministry of Public Works; Ministry of Lands; Ministry of Transport; and, the Ministry of Nairobi Metropolitan Development. A well designed questionnaire was also used. Secondary sources, mainly policy documents on the above related issues under investigation were sources of data and information too. Data was also collected through the researcher's own observations.

2.2 Data Analysis

Counterfactual analysis was mainly used to analyze data. A mathematical model on a scale of 0 to 10 was developed to score the performance of each of the eight principles to facilitate hypothesis testing on the objective.

Where:
0 (0%) = No Performance
1 − 4 (10%-40%) = Low Performance
5 (50%) = Medium/Average Performance
6 − 9 (60%-90%) = High Performance
10 (100%) = Excellent Performance.

3. Research Findings

3.1 Land use Planning vis-à-vis Congestion Management Strategies.

The researcher was not able to access Nairobi's Development Plan. However, secondary literature provided some highlights about the city:

- Nairobi was founded by the British in 1899 as a simple rail depot on the railway linking Mombasa to Uganda and quickly grew to become the capital of British East Africa in 1907 and eventually the capital of a free Kenyan Republic in 1963.
- Nairobi is the most populous city in East Africa with a population of 3.1 million inhabitants and the 12th largest in Africa.
- It is home to thousands of Kenyan businesses and over 100 major international companies and organizations including the United Nations Environmental Programme (UNEP).
- It is an established hub for culture and business.
- The city is surrounded by several expanding villa suburbs.
- The Globalization and World Cities study Group and Network (GaWC) defines Nairobi as a prominent social centre, UNEP Reports, Wikipedia (2011).

Based on the above information, it is evident that the traffic jams witnessed today is because Nairobi spontaneously developed into a city without adequate planning and meant to provide virtually all government

and private sector services, business and employment opportunities without comparison to any other major town in the country but all squeezed into a very small geographic area.

3.2 Developments in New Roads Infrastructure.

The five main roads linking the city's surrounding to the CBD, Mombasa Road, Langata Road, Thika Highway, Waiyaki Way, Ngong Road and Jogoo Road were constructed in the early 1960s and 1970s. There hasn't been a new road linking the CBD with the city's environs to be constructed since then. The study though was specifically interested in new road construction from the year 2001 to 2012. One of the reason for this is lack of space as the areas surrounding the CBD have now become residential places, Westlands, Nairobi West, Pangani, Ngara, Kariokor, Kaloleni, Mbotela, State House, Adams Arcade, Kibera, Hurlingham, Milimani, etc. The scenario exhibits lack of vision or envisaged expansion of the CBD and the city in general in relation to growth in vehicle numbers over time.

In addition, it was noted that most of the above listed roads linking the CBD are dual carriages with the less capacity to accommodate large volumes of vehicles apart from Ngong Road, some sections of Jogoo Road and Mombasa Road that is why traffic was mainly realized to build a few kilometers, 8 km in average to the CBD as all vehicles struggle to either find space into CBD or pass-by to other destinations like Westlands and Industrial Area. The several round-abouts within these roads were noted to be the major build-up points of traffic jams as vehicles criss-crossed towards their respective destinations.

3.3 Modification of Existing Infrastructure

The expansion of Thika Highway into an eight lane network has eased congestion tremendously with distances that took hours to CBD now taking a few minutes. There are various road modification projects currently underway such the Southern-Bypass. As evidenced by the expansion of Thika Highway, such projects will of course significantly ease congestion.

3.4 Encouraging use of Public Transport

The perceptions that motorists fronted regarding inadequacy of the public transportation system in the city were as shown in the Figure 1:
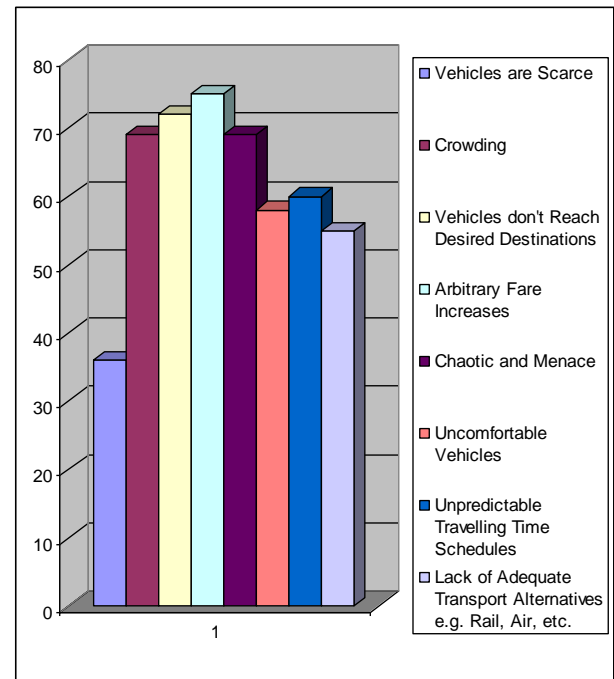

Figure 1: Perceptions on Problems with Public Transport (%) (Source: Author, 2011)

With the exception of 36% of the motorists who said scarcity of vehicles is not a problem as regards public transportation, majority of them cited crowding (69%); vehicles not reaching desired destinations (72%); arbitrary fare increases (75%); chaos and menace (69%); lack of comfort (58%); unpredictability of traveling time schedules (60%); and, lack of adequate transportation alternatives such as rail and air (55%), as key problems related to the public transportation system in the city.

3.5 Improving Traffic Operations

Though some Frequency Modulation (FM) radio stations and television channels in the morning and evening are doing a good job of broadcast information on the city's road situations, the frequency and coverage is not adequate enough to enable travelers reschedule trips to enhance easy flow of vehicles.

Broadcasting traffic information would work very effectively in managing flow of traffic if it was compulsory to all radio stations as most cars do not have mobile television equipments. Incident management mechanisms are also very ineffective and sometimes very expensive. Minor accidents and downpours have caused very heavy traffic jams in the city's roads at some point. It is common to find very old towing-vessels stationed just along the city's roads or towing broken down vehicles. Traffic Police and Lights were equally ineffective in managing traffic.

3.6 Parking Management

Parking charges are seen more as sources of revenue by the NCC and other providers than a mechanism to managing traffic congestion through discouraging entry into areas where it is encompassed. It is just desirable that all parking slots are filled at all times and entry of vehicles will not therefore be stopped even when all parking slots within the CBD fully occupied.

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3.7 Institutional Arrangements Managing Congestion

There isn't a single agency mandated with the sole responsibility of managing traffic congestion in the city which has led to ineffectiveness and inconsistencies in congestion management strategies.

3.8 Congestion Pricing Schemes

The city did not apply congestion pricing schemes and therefore demand for entry into the CBD is not limited causing traffic jams in its roads during peak periods.

3.9 Modeling Performance of Congestion Contributory Factors

On a scale of 0 - 10 the study scored the performance of how the above strategies were implemented by authorities in the city and the results are as indicated in the table below. The scores are based on the discussions of each respective variable as highlighted above.

Table 2: Performance of Strategies for Managing Congestion

No.	Factor under Study	Maximum Score (Scale: 0 – 10)	Actual Score of Factor as Investigated
1.	Coordinating land use planning with congestion management planning.	10	1
2.	Developments in New Road Infrastructure.	10	1
3.	Modification of Existing Infrastructure.	10	6
4.	Encouraging Use of Public Transport.	10	2
5.	Improving Traffic Operations.	10	5
6.	Parking Management in relation to congestion management.	10	2
7.	Institutional Arrangements Managing Congestion.	10	4
8.	Congestion Pricing Schemes	10	1
	TOTAL	80	22
	Percentage Score of Performance of all the Factors	22/80 x 100 = 27.5%	

(Source: Author, 2011)

At a score of 27.5%, an average of 2.75 points per factor, the performance of the city's Authorities was low on these traffic decongestion strategies discussed above. This explains the high levels of congestions exhibited in the city's roads on a daily basis.

4. Conclusion

The genesis of traffic congestion in Nairobi was observed to be historical due to poor land use planning that did not provide for congestion management strategies way back in the 1900s when Nairobi was established as the country's capital city intended to provide all citizens' services and jobs. As a result, the main link roads to the CBD that is, Mombasa Road, Thika Road, Uhuru Highway, Langata Road, Waiyaki Way are always chocked as everyone tries to reach the CBD for services and to work. Further, with

the exception of the recently reconstructed Thika Road, there has been little infrastructural development particularly on the main link roads leading to the CBD to accommodate the growing numbers of personal cars and instead they have remained the narrow two-vehicles roads that were constructed in the 1960s and 1970s. Though transport authorities are also currently undertaking infrastructural modification projects around the city to ease traffic jams, the main roads leading to the CBD are still marked with many round-abouts and junctions which have turned out to be a major cause of delays and congestion. Parking and congestion pricing policies must be reviewed in the city to enhance congestion management strategies.

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