

Planning Daily Work Trip under Congested Abuja – Keffi Road Corridor

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Abstract: *Uncontrolled motorization is one of the major causes of traffic congestion along the outer ring corridor of Abuja due to the absence of adequate mitigation measures. The purpose of this paper is to identify the traffic influencing events causing congestion, determine the travel time reliability along Abuja – Keffi corridor and to develop a variety of reliability measures, such as; planning time, planning time index and the buffer index for commuters to plan well his/her journey. The process of traffic impact mitigation was examined in this study and it was found that buffer index will provide commuters extra time needed to ensure a high rate of on-time arrival. However, it is recommended that the traveller should allow extra time for the trip in order to ensure on-time arrival 95 percent of the time while the Federal Capital Territory Administration (FCTA) or the Federal Government of Nigeria should develop more explicit policy tools for mitigating the traffic impact along this outer ring corridors of Abuja.*

Keywords: *Traffic Influencing Events, Traffic Congestion, Travel Time Reliability, Traffic Mitigation Measures*

1. Introduction

Nigeria's increasing population over the years coupled with diminishing resources has worsened its transport system especially in the sub-urban and urban centres like Abuja. As a result, the demand for transport far outstripped the supply while high cost of transport and lack of passenger information system are some of the problems facing the average commuters. Statistics indicated that road transport is the dominant mode of transportation in Africa [1]. For instance, in Nigeria about 90% of all transport is by road. The author further stressed that excessive pressure on the available road supply coupled with low performance of the transport system, poor management system, low level of investment in transport infrastructure and increasing urbanization has adverse effects on the traffic performance, leading to congested roads in some of these cities.

However, if additional roads are the only solution used to address mobility concerns, it appears that the growth in facilities has to be at a rate slightly greater than travel growth in order to maintain constant travel times. In the US, congestion causes a total delay of about 5 billion hours per year. The Texas Transportation Institute estimates that in 2000, the 75 largest metropolitan areas experienced 3.6 billion vehicle hours of delay, resulting in 5.7 billion gallons in wasted fuel and \$67.5 billion in lost productivity [2].

The individual cost of congestion exceeded \$900 per driver in 1997 resulting in over \$72 billion in lost wages and wasted fuel in the US alone³. Overall, congestion costs in OECD countries were reported to average 2 percent of GDP. In developing countries, the situation is no different. It is reported that wasted petrol costs delivers in Bangkok, Thailand, an estimated \$US 1.4 million every day [3]

In Lagos, Nigeria, one of the measures instituted to reduce traffic on the network and improve performance was allowing the use of the road network by vehicles of even and odd number registration on alternative days. Lack of financial and technical resources and proper institutional arrangement for supervision and control coupled with poor public awareness produced little results until the programme was terminated. However,

complex safety problems arise as the roads and infrastructures have not been developed at the same pace as the provision of urban transport.

2. Description of Study Area

Abuja is a city in the central part of Nigeria and the Federal Capital of Nigeria. Abuja is about 1250m (about 4100 ft) above sea level, occupying 713km² of land area. The city average monthly temperature is in the range 210- 250 C (690 - 770 F). The city center of Abuja is crowded with a mix business wholesale and retail outlets which attracts customers from all parts of the country. Also, the three outer ring corridors of Abuja generate high traffic levels due to high rate of daily drift from sub-urban area into Abuja especially along Abuja – Keffi corridor. This concentration of activities as well as the high traffic levels explains the recurring traffic congestion at peak periods and the need for traffic management operations to maintain acceptable levels of traffic performance.

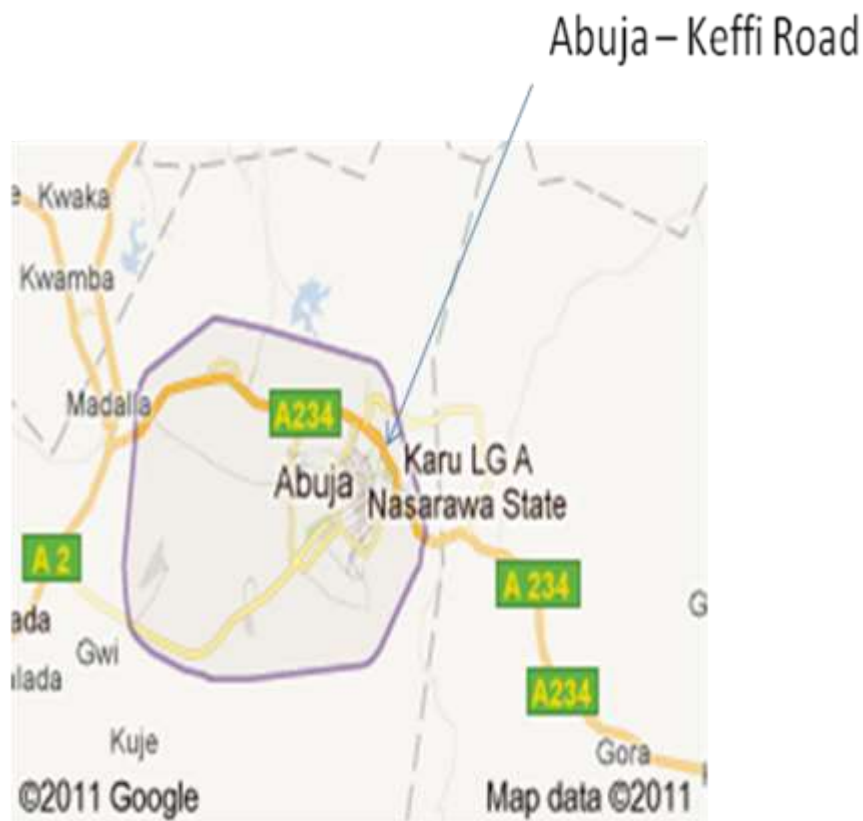


Fig 1: Map of Abuja showing the study road (Source: Ibitoye AB and Bello AB (2012))

Statistics has shown that the city population is growing in relation to vehicle ownership and is likely to continue to grow in future. The growth pattern of the population and vehicle registration of Abuja between the years of 2000 and 2010 is shown in Fig. 2. The implication of all these is an unexpected growth in the traffic levels which may lead to overloading of some major sub-urban corridor such as Abuja – Keffi road [4]. It can be established that there is a corresponding increase in the number of vehicles being registered to the rise in the population.

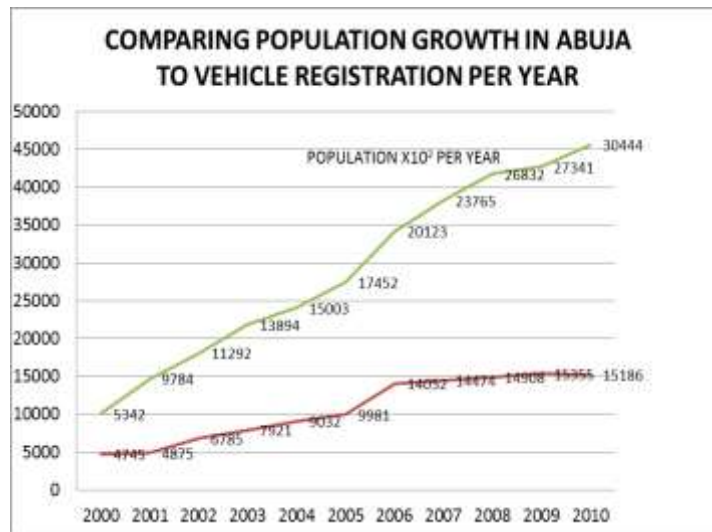


Fig. 2: Growth Pattern of Abuja population and Vehicle Registration

Fig.2 shows the statistics relating population to vehicle registration in the city. It can be established that there is a corresponding increase in the number of vehicles being registered to the rise in the population.

3. Methodology

The method of *95th percentile travel times* was used to measure travel time reliability. It estimates how bad delay will be on specific routes during the heaviest traffic days. The one or two bad days each month mark the 95th or 90th percentile, respectively. Users familiar with the route (such as commuters) can see how bad traffic is during those few bad days and plan their trips accordingly.

Two hours video coverage each was recorded for both peak and non-peak periods (weekday and weekend) at the three critical congested locations along the road. The travel time of vehicles during peak and non-peak period at each location was analyzed using random selection method while playing back the video at 15 minutes interval. The events that impede traffic flow and cause travel to be unreliable often occur in combination. An analysis of how the combination of these events affect the travel time reliability was carried out along Abuja – Keffi road for the weekday and weekend during peak and non-peak period respectively. The possible trips and travel time are plotted to illustrate the travel time variation. Few roadside interviews were also conducted to test the view of travelers on daily trip. It was revealed that it becomes hard for travellers to predict how long time to commute to work. It appears even more difficult for travellers to plan their work trip as most offices resume work by 8.00am and the road section is always filled up beyond capacity between the hours of 7am and 9am (see Fig. 5). This uncertainty in travel time could introduce extra travel time and cost into the daily trip in order to account for time variability thereby resulting in travel time reliability.

4. Results and Discussions

Figures 3 and 4 below show the traffic situations during peak period at Karu junction and Nyanyan respectively. This traffic incidence occurring in erratic patterns in form of unpredictable blocking of lanes contributes significantly to making travel unreliable for commuters.



Fig 3: Traffic Situation at Karu Junction showing Effect of Merging Traffic



Fig 4: Traffic Situation at Nyanyan showing Effect of Breakdown Vehicles

As shown in Figures 5, the index value for planning time is 1.65 compared to index value of 1.25 for the travel time during peak hour (7.00am – 9.00am). This implies that for a trip that takes 15 minutes in light traffic a traveler should budget a total of 25 minutes to ensure on-time arrival 95 percent of the time. Thus, the travel time becomes unreliable during the weekday as unusual circumstances can dramatically change the performance of the road, thereby affecting both travel speed and throughput volume. The road then becomes susceptible to traffic delay and may result in jam density.

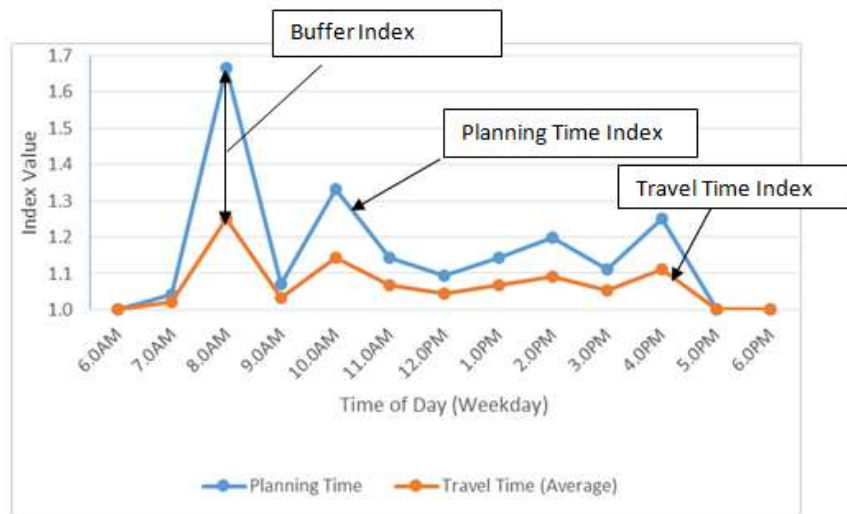


Fig. 5: Reliability measures compared to average congestion measures

The *planning time index* represents how much total time a traveller should allow to ensure on-time arrival.

The travel time index is a measure of average conditions that tells on average, travel times are during congestion compared to during light traffic.

The *buffer index* represents the extra time (or time cushion) that travellers must add to their average travel time when planning trips to ensure on-time arrival.

Variability is determined by how travel times vary over time, and developing of trip frequency distributions reflects how much variability exists. This implies that every traveller needs a buffer or extra time to ensure a high rate of on-time arrival and thereby helps in the development of variability measures.

5. Conclusion

The study has been able to identify congestion and its causes, estimate the travel time and determine the variability of average travel time. It observed that increasing traffic leads to increasing severity, spatial extension and duration of congestion. The two immediate consequences of congestion; travel times that increase on average and that travel times become increasingly variable and unpredictable are becoming a major concern for transportation agencies. However, at present, there is no well-established practice of accounting for changes in average travel time and changes in the variability of travel times. The interaction between travel demand, traffic flow, congestion, travel time variability, and individual scheduling choices should be understood by the commuters as well as government agencies that are responsible for planning road networks in Nigeria. Therefore, like many developed countries, Nigeria should try to improve the performance of the existing transport systems in order to enhance mobility and safety, reduce demand for car use, and improve traffic fluidity.

6. References

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