THE IMPACT OF WEATHER-RELATED ROAD TRAFFIC CONGESTION ON TRANSPORTATION COST IN BENIN CITY, NIGERIA

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ABSTRACT

The research examined weather related traffic congestion with a view of assessing ways of decongesting the City of Benin for effective development. Measurement of the width of the roads, traffic volumes along the routes was done complimented by oral interview. Result revealed no significant relationship between traffic congestion and road network characteristics. However, there is a statistical relationship between weather-related traffic congestion and transportation cost. Enhanced transportation system and coordination with the introduction of more bus-stop were recommended.

Keywords: Traffic Congestion, Transportation System, Road Network.

BACKGROUND OF THE STUDY

Transportation is inherently central to development of nations. It is not only a necessity to life, but also has a resultant effect on all aspects of human existence (Oyesiku, 2002). It provides access to goods, service and social activities to maintain good quality of life. It is fundamental in breaking isolation and thus strengthening individuals' capital base (World Bank Report, 2002; Odufuwa, 2006).

One major problem that increases the inaccessibility of roads today is traffic congestion. In many metropolitan areas, there are increasing concerns about how the growth of traffic congestion may adversely affect the areas economy (business, sales and income), as well as concerns about the relative benefits cost ratio or return on investment associated with alternative projects of policies to address those problems (Weisbrod and Treyz, 2001)

Mayhew (2006) Suggested, that congestion (traffic type), may be considered as the restriction of the use of road transport facility by over use of them. She stressed that; the term is generally used to indicate the slowing of urban traffic, because too many vehicles are competing for too little space. Similarly, Weisbrod *et al.,* (2001) suggested that traffic congestion could be defined as a condition of traffic delay (when the flow of traffic is slowed below reasonable speed) because the number of vehicles trying to use the road exceeds the traffic network capacity to handle them. Thus, when congestion continues unchecked it can lead to poverty (Ozabor, 2010).

Poverty to one end, does not necessarily mean low or inadequate income, but refers also to lack of physical necessities and other assets. Again, poverty implies, deprivation of human needs that are not met, for instance, accessibility is germane to the emergency of poverty. Thus, significant lack of access to resources, employment and market, would inevitably results in low productivity, low incomes and implicitly

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lead to poverty (Mbara, 2002). In light of this, enhanced productivity can be constrained by failure to provide, the requisite transport infrastructure (Olufemi and Oluseyi, 2002)

The relationship between transportation effectiveness and fundamental development is of practical importance. Apart from economic importance, social consequences are also considerable. Transportation system is a requirement to sustain large-scale production, facilitate, geographic specialization, vital to national defense, and transportation requirement always needs to be considered in location decisions (Federal Highway Administration United States Department of Transportation, 2002).

Furthermore, transportation is a great unifying force particularly for large countries such as; Nigeria (Ofune, 2006) transportation helps in further broadening of economic, social and cultural goals and development (Ileoje, Odemerho and Onokala, 2002). With all the advantages transportation provides as mentioned above, it should be noted that access, provides a central integrating concept with which to understand complex complementarities between subsistence economic and social needs. In other words accessibility can be viewed inform of provision of access and the ease with which a need is satisfied (Ozabor, 2010).

Access in transportation language, can be viewed as availability of transport service whenever users need them (Olufemi and Oluseyi, 2007). Furthermore, increased improvement in transportation infrastructures and transport service can thus, enable urban poor to meet subsistence economic and social needs more easily. Therefore, increased cost in transportation fees occasioned by road traffic congestion, may as well increase economic and social poverty (Ozabor, 2010)

In Nigeria, road transportation does not meet the global standard, despite the fact that road transportation is the most popular means of movement that account for about 90% of the movement of passengers and freights (Ogunsanya, 2004). Expenditure on road construction and management is however disheartening when compared with that of other countries (Oguunsanya, 2004) Oni, 2004 Oyesiku and Odufuwa 2002)

Generally one manifestation of non-maintenance of roads is road traffic congestion. This is further worsened, when there is high demand for these unmanaged roads, occasioned by high population growth. This has a nexus that has its final effects on the transport users (especially the passengers) (Ozabor, 2010).This study therefore, intends to investigate the impact of road traffic congestion on transport cost in Benin City.

STATEMENT OF THE PROBLEM

Traffic congestion occurs when urban road network is no longer able to accommodate the volume of traffic that uses them. This situation is caused partly by rapid growth in motorization with less than corresponding improvement, in the road network and related facilities. Congestion increases travel cost and caused physical

and psychological discomfort. It creates stress and frustration, irritability, high blood pressure and cardiac irregularities (Ogunsanya, 2002)

In 1979, the Texas transportation institute (TTI) studied cities in the united state of American and observed that congestion cost in these cities amounted to $72 billion. In Britain, divers loose about 1.5 billion man hours a year to traffic congestion (Ogunsanya 2002). In Nigeria, traffic congestion has turned mobility by road into a nightmare (Ogunleye, 2008). Today a lot of damage has been caused by this unhealthy phenomenon. There is a marked lateness to work, school and business. There are also cases of lowered productivity, chronic fatigue and bad stress. The cumulative effect is a crashing down of the countries gross domestic product (GDP).

The case of Benin City is without exception. The city is known to be enslaved by multifarious burdens of over population, indiscipline of the citizenry as well as a serious failure of leadership on the part oft he ruling elite over the immediate past. In addition, the city is notorious for traffic congestion caused largely as a result of indiscipline and utter disregard for traffic rules on the part of motorist, especially the commercial drivers.

Furthermore the many potholes which lither the roads in some part of the city, make free flow of traffic a mirage, and traffic congestion have become a routine and an unavoidable way of life. To make any trip within the metropolis, one needs to factor a complex of hours into the projected duration to cater for traffic jams. This has a play back effect on the people (passengers) in Benin City. And they take the following forms listed below:

(1) Lateness to school which in turn contributes to students' poor performance in school.

(2) Lateness to work and increase sensitivity towards closing early from work. This has gradually reduced the out put of workers and consequently a distortion in the developmental process and prospect.

(3) Systematic increase in production cost occasioned by increase in transportation charge. This has a chain reactive capacity, which therefore culminates in a vicious circle of poverty.

(4) In-crease in fuel consumption by vehicles, which leads to increase in transportation cost for carriage of commodities and people.

Based on the above, it therefore becomes pertinent to study the relative cost, in terms of cash involvement on the part of the passengers, which they spend extra as a result of road traffic congestion Benin City.

AIM AND OBJECTIVES OF THE STUDY

The aim of the study is to examine the Benin-City transport system, with a view to understanding the impact of traffic congestion on transportation cost. To achieve this, the following objectives are enumerated.

(1) To identify the cost of transportation when the roads are congested and the transportation cost when the roads are not congested.

(2) To investigate if congestion have any relationship with transport cost in Benin City.

(3) To suggest mitigation options to traffic congestion problems in Benin City

HYPOTHESIS

The following hypothesis is tested at 0.05 level of significance.

(1) There is no significant relationship between traffic congestion and transportation cost in Benin City.

METHOD AND CONCEPTUAL ISSUE

In the process of carrying out this study, the design was based on personal observation and interview of some road users (Drives and passengers) in Benin City. The data used for the study was basically collected from the secondary source (i.e. data on transport cost for the passed ten (10) years collected from the various motor parks union leaders) Ring road was used to judge the 25 randomly selected routes because it is the central point in which all transport routes in the area terminate. The Spearman's rank correlation Co-efficient was used to analyze the data, and therefore was used as a measure to text the hypothesis, it is mathematically stated:

$$rs = \frac{1 - 6\sum d^2}{n^3 - n}$$

Where:

r^s = Spearman's rank correlation, I = a constant,
Σ = The summation sign
D = The differences between ranked values
n = Number of observation

Sources: Ewhrudjakpor, Atubi and Odemerho (2006)

On the other hand, the study is hinged on the gravity model. The gravity model utilizes a concept borrowed from physics that is; the law of gravity. The traditional form of the model is thus:

$$Ij = \frac{fmim}{Dij}$$

Where;

Ij = The number of interactions between 1 and J during some time period
Dij = The number of interaction between center I and center j
M = Some measure of the size or mass of the interacting pairs of centers. (Onokerhoraye and Ominu, 1995)

In its original formulation, the law of gravity states that, two bodies attack each other in proportion to their masses and inversely to the square of distance between them. By the gravity model, distance is normally measured by linear separation, although other measures include driving time and cost of travel. The distance variable is further modified by an exponent, so as to represent the different friction of distance for the group of commodity under consideration (Onokerhoraye and Omiunu, 1995)

Generally, geographers have used gravity models to predict human dispersal patterns by estimating the flow of people per unit time, based on the distance to and the attractiveness of destination points (Thomas and Hagget, 1980, Sklar and Costanza, 1991). Similarly, the gravity model is commonly used by geographers to predict migration and interaction between populations and regions. Even though rarely used by ecologist, gravity models allow estimation of long distance dispersal between discrete points with heterogeneous landscapes. Bossen Brock *et al.,* (2001) developed a production constrained gravity model to forecast Zebra mussel dispersal into inland lake of Illinois, Indiana, Michigan and Wisconsin, based on the site and location of boats within 364 countries.

A deterministic form of the gravity model was used to estimate best-fit parameters for distance coefficient, create lakes boat-ramp attractiveness and colonization cut off threshold. These analyses suggest that gravity models may be useful in predicting long distance dispersal, when dispersal abilities of species and the attractiveness of potential habitats are known (Ozabor, 2010).

Gravity models are functionally different from diffusion models in that diffusion model estimate movement rates by an organism, where as gravity models estimate the force of attraction between an origin and a destination with the movement rates being a function of this force. Thus diffusion model is more appropriate, if a movement rate can be estimated where as gravity model is more appropriate when distance known or are of interest.

Different types or gravity models exist based upon prior information. A production constrained gravity model is used when information is known about the source and destination populations Bossen Brock *et al.,* (2001) and Schneider *et al*., (1998) were able to use a production attraction constrained gravity model to estimate Zebra mussel dispersal in Illinois because, estimate were available for the number of boaters at both the origins and destinations for movements.

From the view point of spatial interaction, the mass or weight of an area may be thought of as some measure of the relative “attractiveness” of the relevant and possible destination. What constitutes relative attractiveness would depend on the type of interactions involved for instance the relative attractiveness of an area for shopping trips may be measured by one or a combination of the following, the number of square metres of floor space devoted to stores or commercial activities in the area, the range of good, offered by that area, the number and quality of related goods and services available in the area (Onokerhoraye and Omuta, 1994)

The “attractiveness” of an area, increases bases for interaction, especially amongst complimentary regions. This has a chain-like reaction; interaction based on

complementarities amongst a pair of region (that is when two regions are involved, A and B) and complementarities amongst regions (that is when more than two regions are involved), leads to over use of existing road infrastructure, which inevitably leads to road traffic congestion and when there is price system, charges for goods and people's movement will definitely increase. This is based on the assumptions that congestion, consumes more fuel and time from motorists (Ozabor, 2010)

DISCUSSION OF FINDINGS

Average Transportation Cost Along the Routes in Benin City

In this section of the work attempt is made to analyze the average cost of transport in Benin City for 10 years. How ever the table below present the ten years (10) average of transport cost in Benin City.

Table 1: A Table Showing the Average Transport Cost Along the Routes When Congested and When Not Congested, for Ten Years

S/N	List of Routes	Cost When Not Congested in Naira (₦)	Cost When Congested in Naira (₦)	Percentage Increase (₦)
1.	Ring Road / Adolor Road	50	80	60%
2	Ring Road / Ogida Road	50	100	100%
3	Ring Road / Uwelu Road	50	120	140%
4	Ring Road Textile Mill Road	50	80	60%
5	Ring Road / Uwasota Road	70	80	14.3%
6	Ring Road / Siloko Road	40	50	20%
7	Ring Road / Ekehuan Road	40	40	0%
8	Ring Road / Airport Road	30	40	33.3%
9	Ring Road / Ogba Road	70	100	43%
10	Ring Road Adesuwa Road	40	60	50%
11	Ring Road /Boundary Road	80	80	0%
12	Ring Road / Ihama Road	80	80	0%
13	Ring Road / Goodnews Road	50	70	40%
14	Ring Road / Deport Road	70	150	114.3%
15	Ring Road/ Technical College Road	40	40	0%
16	Ring Road / Forestry Road	30	30	0%
17	Ring Road / Taboga Road	40	40	0%
18	Ring Road / Adesuwa Niro Road	60	100	66.7%
19	Ring Road / Ikpoba Hill Road	50	100	100%
20	Ring Road / Mission road	20	20	0%
21	Ring Road / Medical Store Road	100	100	0%
22	Ring Road / M.M way	50	70	40%
23	Ring Road / Dumez Road	40	50	25%
24	Ring Road / Okhoro Road	70	100	43%
25	Ring Road / Federal Govt. College Road	80	80	0%

Source: Fieldwork, 2010.

From table 1 above, it can be observed that some routes are probably more congested than some other routes in the network system. For example, Ring road /Adolor road only increased with 30 naira as was observed in Ring road/Okhoro road. On the other hands, some other routes original charged for transport, when the routes are congested. Some of this route as presented in table 1 above include ring road/Uwelu road (₦50<₦20), Ring road depot road (₦70<₦50).

However, some routes in the network system have an increment of transportation cost by two when the road is congested. These road include, Ring road/Ikpoba hill (₦500<₦1000) Ring road/ Ogida road (₦50<₦100). Again some routes only have a rise in transport cost between ₦40 and ₦20 such routes include, Ring road (₦50<40) Ring road / Adesuwa Niro road (₦60<₦100)

Finally other routes in the network system rather have an in significant rise in transport cost or they do not have any increase at all. The implication of this is that, these routes probably do not experience congestion or even if the route experience congestion problems, it is very minimal. This assumption is based on the congestion chain reaction cycle" propounded by Ozabor (2010) by this assumption it is said that "if there is congestion at all> there must be waste of time> waste of vehicles fuel> wear and tear on the vehicles > and finally increase in cost of transport and commodities transported within that congested period" However these routes include, Ring Road/Dumez Road, Ring Road/Federal Government College Road/ Ring Road / Mission Road, Ring Road / Taboja Road, Ring Road / Forestry Road, Ring Road / Technical College Road Ring Road / Boundary Road, Ring Road / Ihama road

THE RELATIONSHIP BETWEEN TRANSPORTATION COST AND ROAD TRAFFIC CONGESTION IN BEINN CITY

In this section of the work, an attempt is made to investigate the relationship between the road traffic congestion in Benin City and the transport cost there from. To do this the spear man's rank correlation co-efficient was used and the following hypothesis was thus tested "There is no significant relationship between transportation cost and road traffic congestion in Benin city".

However, the spear man's rank correlation statistics, revealed a correlation value of 0.71. To this end, the relationship between traffic congestion and transport cost is positive, by implication as congestion increases transport cost (prices) also increases on the other hand to test the hypothesis formula below was used

$$t = rs\frac{\sqrt{n-2}}{r-rs^2}$$

From the formula above a calculation value of 5.01 was realized; when this calculated value is compared with the table value at 0.05 level of significance, the table value is less than the calculated value i.e. (1.708<5.01). This implies that there is a significant relationship between traffic congestion and transportation cost in Benin City.

RECOMMENDATIONS

Based on the findings, the following recommendations are hereby advanced,

A Enhanced transport co-ordination
B Introduction of an effective bus stop system
C Passenger travel time should be encouraged
D Enforcement of public parking space
F Drivers enlightenment.

CONCLUSION

The study investigated the impact of road traffic congestion of transport cost in Benin city from the data available, it way deduced that road traffic congestion is already having an impact on transport cost in Benin city increasing the cost. On the other hand, among other suggestion, introduction public parking space, enforcement of traffic rules, public enlightenment, were suggested as mitigation options.

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