



GLOBAL JOURNAL OF SCIENCE FRONTIER RESEARCH: F
MATHEMATICS AND DECISION SCIENCES
Volume 18 Issue 5 Version 1.0 Year 2018
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Causes and Effects of Traffic Congestions in Nigeria

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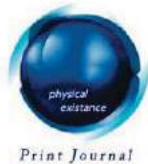
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GJSFR-F Classification: FOR Code: MSC 2010: 47N30



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Causes and Effects of Traffic Congestions in Nigeria

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Keywords: traffic congestions, road network, coefficient of variation, standard deviation, road accidents, standard of living, population, infrastructure, drivers' license, number plate, economy.

I. INTRODUCTION

The examination of the background of the causes and effects of traffic congestions in Nigeria revealed huge existence of the negative effects of the scenario. In this research work, efforts were made to bring related information from various sources of literature with key issues put across to ascertain what is exactly happening, the likely challenges that are to be faced if measures are not taken to curb traffic congestion. The goal of this study, objectives and questions, positioned the necessary actions required to ensure straightforward and easy flow of traffic in Nigeria and other related countries. Nigeria, as the case study was chosen to represent other countries and societies that experience similar conditions. In describing the scope, location and limits of the study in terms of coverage, the period in which the study was carried out and the relevance of its findings, Nigeria was specifically chosen as the largest country in Africa and one of the most populated countries of the world. Nigeria faces extreme traffic congestion where cars in the country travel at speeds of about 3-5km/hr. On most of the busy days of the week such as the workdays and during rush hours like the morning and evening hours, there exist extremely significant congestions popularly known as hold-ups or goes-slow.

The 2017 record of the National Bureau of Statistics (NBS) estimated the vehicle population of 11458370 as at the first quarter of the year with 58.8 percent of commercial vehicles [1]. The number of private vehicles amounted to 44.5 percent of the

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total vehicle population in Nigeria for the same year. Also, the government and diplomatic vehicles contributed to respective figures of 1.65 and 0.1 percents of the total vehicle population in the country. The report published by NBS reviewed that the Lagos and FCT produced the highest number of national drivers licenses while Yobe and Kebbi States had the least out of the total number of 220736. In the same year, a total number of 113358 vehicle number plates were produced in the first quarter alone. Lagos and Sokoto states produced the least while Ebonyi and Anambra produced the highest. In the third quarter, the total number of registered vehicles is 11547236. In 2013, an abstract statistical study estimated that more than 1004469 motor vehicle number plates 395539 drivers' licenses and 254667 motor cycles number plates were produced across the 36 states of Nigeria and Federal Capital Territory (FCT).

Comparing the vehicle population in Nigeria to the overall population of people in the country as at 2016, the vehicle population ratio is 0.06. Rampant population growth could be a contributing factor to traffic congestion in Nigeria's capital cities Nigeria hence it needs to be checked [2]. Traffic congestion in Nigeria is also likely to be caused by poor conditioned roads that cannot contain the vehicle population, ongoing road constructions that usually take long, population and economic growth hence increased purchasing power and demand for vehicles and stubborn drivers that do not follow road rules and regulations which need to be investigated.

Traffic congestion leads to increased pollution of the air with fumes from cars, increased travel times leading to delays hence loss of investment opportunities [3]. It could also bring about increased pedestrian risks and road accidents. The objectives of this research include the identification of the degree and depth of traffic congestion and the evaluation of the causes in Nigeria. Also, maximum efforts were made to identify and establish relationship between the causes and effects of the congestion. Critically, the review of existing theories in available literature as related to the research developments were examined which helped to develop this unique and meaningful study. The definitions of key terms that were used throughout the study compared and contrasted the information from different sources to come up with summary of the indices that causes traffic congestions and their effects to growth and development of Nigeria's economy. Also, findings made at the cause of this study thoroughly identified main issues relating to the causes and effects of traffic congestions and proffers possible solutions.

Lagos, Abuja, Kano, Port-Harcourt, Aba and other capital cities are business districts with city centre converses, where development is compact. The cost of land is considered relatively high, in comparison to suburban areas. The high cost of land with high rise structures, justifies the dense development pattern in the capital cities. All the thirty-six state capitals including the Federal Capital Territory and other major cities are jam-packed with commercials, offices, retails, and cultural centre of the cities and usually are the centre points for transportation. Some of the theories and concepts usually adopted in the management of capital cities include central place theory that consider cities as a system; compact city theory, which according to [4], points to initiatives of promoting compact cities that emphasizes higher level of mixing and integration of functions; concept of accessibility that centre on proximity of two or more places, emphasizing availability of opportunity in geographical region and freedom of individuals to participate [5].

The traffic congestion is drive by too many people working in the capital city areas, coupled with narrow streets and shortage of off-street parking facilities. This makes on-street parking inevitable and reduces road design capacity resulting in traffic

Ref

5. Jende Hsu, A.M. and Surti, V.H.M. (1976). Demand Model for Bus Network Design. *Transportation Journal of ASCE* Vol. 102, No. TE3.

jam. Solutions tried so far have not yielded the desired result in alleviating traffic congestion in cities, these include construction of ring-roads or by-passes, introduction of congestion charges or outright banning of motor cycles from entering the capital cities, park and ride schemes, car-pooling, traffic calming, public transport subsidies, toll road, regulatory changes to increase density, parking levies and restrictions in area well served by public transport; among other [6]. Traffics are the automobiles that are on a road at a particular time. They are the automobiles that are utilized for the purpose of transportation [7]. Traffic on road consists of pedestrians, ridden or herded animals, vehicles, streetcars, buses and other conveyances, either singly or together, while using the public way for purposes of travel [8]. The abstract statistical study estimated that more than 1004469, 560987, 303274 vehicles were registered in 2013, 2014 and 2015.

The other half of congestion is caused by random events such as accidents and unusual weather conditions (rain, storms, etc.), which are unexpected and unplanned. Non-recurrent congestion is linked to the presence and effectiveness of incident response strategies. As far as accidents are concerned, their randomness is influenced by the level of traffic as the higher the traffic on specific road segments the higher the probability of accidents [9]. Traffic Congestion occurs when there is an imbalance between transport demand and supply at a specific point in time and in a specific section of the transport system. It implies that the available transport infrastructure at that given time is being overstretched. Congestion can be perceived as an unavoidable consequence of the usage of scarce transport resources, particularly if they are not priced. The last decades have seen the extension of roads in rural but particularly in urban areas, most of them free of access. Those infrastructures were designed for speed and high capacity, but the growth of urban circulation occurred at a rate higher than often expected [10].

Congestion is one of the most prevalent transport problems in large urban states, usually above one million inhabitants [11]. It is particularly linked with motorization and the diffusion of the automobile, which has increased the demand for transport infrastructures. However, the supply of infrastructures has often not been able to keep up with the growth of mobility. Since vehicles spend the majority of the time parked, motorization has exceeded the parking lot available which has created space consumption problems particularly in capital cities. Some state capitals are mono centric structure as single centered and poorly planned cities; Nigeria cannot exist without traffic Jam. According to [12], there is an ever increasing importation of used cars. Currently there are over 11880000 registered cars in Nigeria, poorly planned roads and building, reckless driving and motor cycling and an ever growing population in Nigeria due to rural-urban migration are the common factors.

One of the major negative effects of traffic congestion in Nigeria is the cause of high difficulties for non-motorized transport. These difficulties are either the outcome of intense traffic, where the mobility of pedestrians, bicycles and vehicles are impaired, but also because of a deliberate lack of consideration for pedestrians and bicycles in the physical design of infrastructures and facilities. This is a common sight in most urban centers in where vehicle owners are at loggerhead with motorbike riders. It causes incessant loss of public spaces especially in Lagos. The majority of roads are publicly owned and free of access. According to the state of environment report, the national environment watchdog, the increase in motor vehicles has resulted in an increase in pollution, traffic congestion and a reduction in the quality of life for urban dwellers. It says, adding that motorbikes are hazardous and add to the traffic congestion, air pollution and disorganization in urban centres.

Burning fossil fuels like oil and petrol from vehicles emit carbon dioxide, a main greenhouse gas which contributes to global warming. Vehicle fuel has a sulphur gas component which causes respiratory diseases of which cancer is one of them [13]. Alongside burning tyres on roads and release of burnt oil by vehicles is not only hazardous to human health, but also roads as they shorten their lifespan. Increased traffic has adverse impacts on public activities which once crowded the streets such as markets, shops/cubicle, parades and processions, games, and community interaction [14]. Traffic flows influence the life and interactions of residents and their usage of street space. More traffic impedes social interactions and street activities. The Nigerian state capitals have to deal with thousands of cars running through their streets each day. Traffic congestion is a big problem for everyone within the cities. The main causes of this problem are lack of regulatory rules on purchase of more cars, poor road management, and poor practices on behalf of employers.

One of the main reasons why there exists more congestion is due to more cars on the road. The adult population is increasing and therefore more people want their own personal transport to get around with. As the number of cars increase the chance of congestion also increases. This is coupled with a lack of proper infrastructure. Though in smaller towns and villages congestion is almost unheard of, they constitute little or no significant impact to the country's economy. Councils and national governments fail to act on the looming threat of heavy congestion until it happens. The city roads do not expand along with an increasingly car reliant population. A single street with a lane on each side before might not suffice in ten years after the population has increased. Authorities often fail to convert this into a dual carriageway.

II. RESEARCH METHODOLOGY

The study explored the problem in a positive view, using descriptive research strategy because it aims to know more about the phenomena that are responsible for traffic congestion and its effects in Nigeria. This research examined the problem in both descriptive and exploratory manner. It also looked into the problem by exploring the views of different set of respondents, as well as exploring different literatures related with the study. The population included various riders, passengers, pedestrians and traffic police officers found in the randomly selected major cities in Nigeria. Primary data was collected from the respondents that were chosen in Nigeria cities while the secondary data was obtained from the published works of the National Bureau of Statistics. The summary and analysis of the data was done using R program and SPSS.

The research analysis was divided into descriptive and inferential analysis. Descriptive analysis was adopted in the study of distribution of one variable. This study provided us with the information about the various types of traffic jam, their intensity and their span. After that, the use of inferential analysis was basically adopted to analyze the data. In other words, inferential analysis simultaneously analyzes the variables. The interdependence between the variables, their correlation, and variance analysis were employed to draw the inferences. Comparing the distribution of the drivers' license in the respective years, it is quite clear that 2015 has least variation relative to the mean. The coefficient of variation was particularly useful when comparing results for the three years of produced drivers license, number plates of motor vehicles and motor cycles. The different measures or values were examined to ascertain the increase or decrease in traffic congestions. The formula for the coefficient of variation was used as the ratio of the mean and standard deviation. In symbols: CV

Ref

13. Link, Heike (2004). "PEP-A Yield-Management Scheme for Rail Passenger Fares in Germany". Japan Railway & Transport Review. 38: 54.

= (SD/) × 100. Multiplying the coefficient by 100 is an optional step to get a percentage, as opposed to a decimal.

Researches on city structure, especially dealing with the problems of congestion and traffic jam adopted mathematical theories such as [15], ‘three phase traffic theory’, which likened traffic flows to the rule of fluid dynamics, noting pipe suddenly freezing representing traffic jam triggered ‘butterfly effect’ with spontaneous driver’s maneuvering or traffic light control, distorting traffic flow. When the capital cities were observed in terms of problems and challenges, two major issues were identified. The first one is mainly urban decay or run-down, creating undesirable condition to reside; and secondly, traffic congestion within the city centres. Congestion is said to occur when transport demand exceeds transport supply at a specific point in time and in a specific section of the transport system [16]. Analytical Summary of the Annual Vehicle Statistics in Nigeria was assessed during the study by the examination of the drivers’ licenses and number plates processed per state, and from the year 2013 to 2015. One of the best ways used to assess the level of variability of the data set was through the analysis and examination of variation about the mean.

III. RESULTS AND DISCUSSIONS

In most statistical analysis, it is not common to see a situation where the value of standard deviation is greater than the value of the mean. However, it is often seen in real life situations and during practical researches. A sample’s standard deviation that is of greater magnitude than its mean can indicate different things depending on the data being analyzed. Statically, the mean is seen as the center of location while the standard deviation measures how dispersed the individual observations occur around the mean. Since the mean is seen as the midpoint of a statistical data and the standard deviation is described the data’s spread, it is easier to find the distribution of the license, number plates of motor vehicles and motor cycles across the states in the respective years. It helps to know the cities that are over congested with the number of vehicles. All the standard deviations in the case study are larger than the mean except motor cycle number plates produced in 2015. This was as a result of the limitation of the use of motor vehicles in some major cities in Nigeria. It helped to harmonize the distribution and use of motor vehicles. It is also evidence that if a similar measure is taken in the use of motor vehicles, there is no doubt the fact that traffic congestions will be minimal in Nigeria.

Table 1: Summary of the drivers licenses processed (2013 – 2015)

States	X2013	X2014	X2015
ABIA: 1	Min.: 1274	Min.: 1349	Min.: 2375
ADAMAWA: 1	1st Qu.: 2588	1st Qu.: 3464	1st Qu.: 8916
AKWA-IBOM: 1	Median: 4576	Median: 7954	Median: 17623
ANAMBRA: 1	Mean: 10690	Mean: 17650	Mean: 31133
BAUCHI: 1	3rd Qu.: 8726	3rd Qu.: 13253	3rd Qu.: 31303
BAYELSA: 1	Max.: 127261	Max.:225284	Max.:298319
BENUE: 1	Sum: 395539	Sum:653046	Sum:1151906
BORNO: 1	Var.:460959583	Var.:1402510511	Var.:2520309750
CROSSRIVER: 1	CV.: 2.008416	CV.: 2.121819	CV.: 1.612523
(Other): 28	Sd.: 21469.97	Sd.: 37450.11	Sd.: 50202.69

Ref

15. Adrian May (2007). "The philosophy and practice of Taktfahrplan: a case-study of the East Coast Main Line" (Working Paper). Working Paper 579. Institute of Transport Studies, University of Leeds, Leeds, UK. Retrieved 2008-04-27.

The wide and uneven distribution of the data was shown in the nature of the standard deviation. When the histogram of the data was observed, there is indication of some cities from Kwara to Nasarawa being widely spread. For example, say your data represent distances measured above and below sea level. Using this information, some inferences were made about the causes and effects of traffic congestions in Nigeria. Some states in Nigeria were significantly higher than the mean level. Also comparing the population distribution in Nigeria, there was a serious indication that the rapid cluster of the vehicles in some particular cities was the indication of incessant traffic congestion in Nigeria. For example, in the first dataset, you could determine whether a particular point was significantly higher above mean level than all others. It represented a statistical variance that was worth investigating based on the amount of standard deviations measured around the mean it was located. One point to clarify is that the concept of standard deviation is not limited to normally distributed data. It is a general concept that applies to data that arise from any distribution.

The coefficient of variation (CV) was used to measure relativity variability [17]. The ratio of the standard deviation to the mean for the drivers licenses produced per state in 2013, 2014 and 2015 respectively were 2.008416, 2.121819 and 1.612523. It was the ratio of the standard deviation to the mean (average). In other words, the standard deviations were 200.84, 212.18 and 161.25 percents of the mean.

Table 2: Summary of Motor Vehicle Number Plate Produced per State and Type (2013-2015)

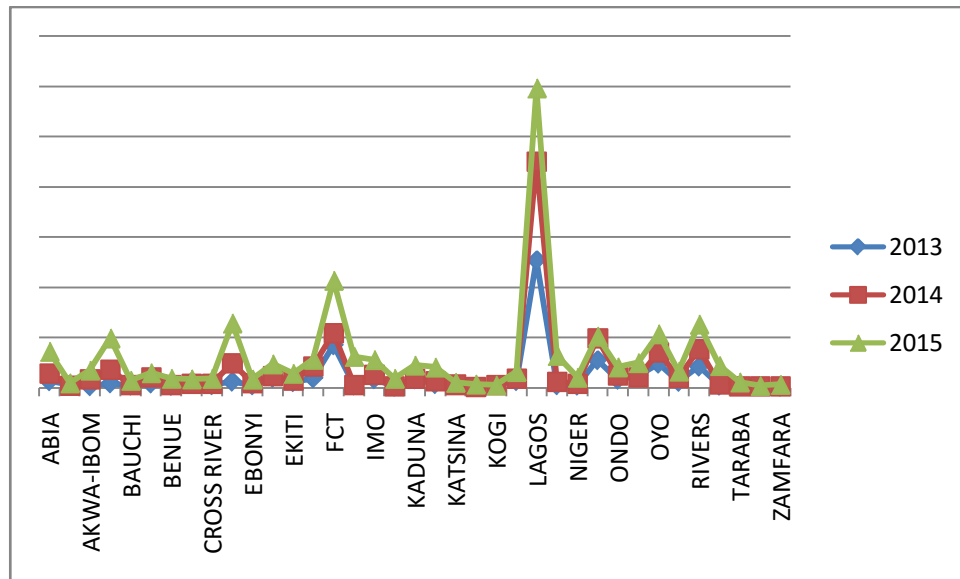
States	X2013	X2014	X2015
ABIA: 1	Min.: 8	Min.: 0	Min.: 0
ADAMAWA: 1	1st Qu.: 6607	1st Qu.: 4716	1st Qu.: 1821
AKWA-IBOM: 1	Median: 9950	Median: 10478	Median: 3915
ANAMBRA: 1	Mean: 25112	Mean: 14025	Mean: 7397
BAUCHI: 1	3rd Qu.: 17216	3rd Qu.: 16805	3rd Qu.: 6913
BAYELSA: 1	Max.: 36907	Max.: 85155	Max.: 76399
BENUE: 1	Sum: 1004469	Sum: 560987	Sum: 303274
BORNO: 1	Var.: 3453009363	Var.: 251043305	Var.: 157850340
CROSS RIVER: 1	Sd.: 58762.31	Sd.: 15844.35	Sd.: 12563.85
DELTA: 1	CV.: 2.340009	CV.: 1.129722	CV.: 1.698506
(Other): 31	NA's: 1	NA's:1	

Observing the motor vehicle plate number produced per state from 2013 to 2015 in Nigeria, the mean average production decreased across the years. The total of 1004469 was produced in 2013 while the least was 2015 with a figure of 303274. It was observed that the year with the least coefficient of variation was 2014. It was also observed that the minimum values of zero were observed in 2015 and 2014. In other words, there were indices such Osun, Lagos and Oyo states which had no plate number production. This is as a result of accumulated ones that had to be sold. The complementary Types were not available in the years that preceded 2015.

Table 3: Summary of Motor Cycle Number Plate Produced per State and Type (2013-2015)

States	X2013	X2014	X2015
ABIA: 1	Min.: 0	Min.: 0	Min.: 0
ADAMAWA: 1	1st Qu.: 1543	1st Qu.: 2401	1st Qu.: 2000
AKWA-IBOM: 1	Median: 4860	Median: 6871	Median: 4233
ANAMBRA: 1	Mean: 6367	Mean: 10460	Mean: 6580
BAUCHI: 1	3rd Qu.: 7197	3rd Qu. : 13327	3rd Qu.: 11114
BAYELSA: 1	Max.: 45521	Max.:52460	Max.: 18061
BENUE: 1	Sum: 254667	Sum:418417	Sum: 269795
BORNO: 1	Var.: 65955825	Var.: 152938318	Var.: 33235757
CROSS RIVER: 1	Sd.: 8121.319	Sd.: 12366.82	Sd.: 5765.046
DELTA: 1	CV.: 1.275533	CV.: 1.182296	CV.: 0.876147
(Other): 31	NA's: 1	NA's: 1	

The Federal government restriction of the movement of motor cycles in some major cities in Nigeria aided the evenly distributed plate numbers of motor cycles produced across the states and types in Nigeria. The coefficient of variation in 2015 was 0.8761 which simply means that the ratio of the standard deviation with respect to the mean could yield a value of 87.61 percent. In the course of the studies, it was discovered that the more dispersed the drivers' license and plate numbers across the states, the less traffic congestions experienced across the years. In other words, rural empowerment is very necessary. The government should not focus attention only in some major states, thereby abandoning others. It causes urban migration, congestions and overcrowded vehicles [18]. It was obvious that one of the causes of traffic congestion is when the population of vehicles outflow the available infrastructures such as good roads, availability of traffic lights and other road regulators.

**Fig. 1:** Drivers licenses processed across the states (2013 -2015)

The above graph shows the increase in vehicle population in Nigeria over the years and it clearly shows a gradual increase in vehicles purchased. Nigeria revenue records showed that more than 1100246 vehicles enter the country every year compared

to the figure for the same period in 1962. Another single cause of traffic congestion in Nigeria is road accidents. Great number of patients admitted in Nigeria hospitals in 2015, 1988 were victims of road accidents. The major cities that connect Lagos – Ibadan express way and other highway road of southeast to the southwestern part of Nigeria experienced a huge increase of road accident from year 2015 to 2017 as a result of congestions. Lagos to Ibadan express road is one of the busiest in the country with the highest traffic count; the number plate of vehicles and licenses issued in Lagos is the largest in the country which accounts for the highest number of accidents being recorded in the road.

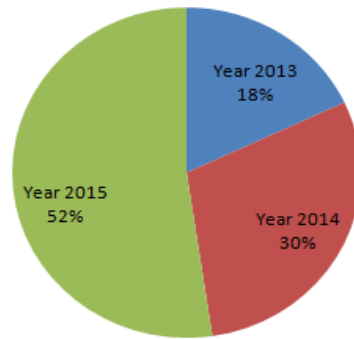


Fig. 2: Drivers licenses processed (2013 -2015)

The chart shows that there is a rapid increase in the number of license issued in Nigeria. It is obvious that measures should be put in place to ensure more roads are created to meet up with the increase number of vehicles that enter the country. Figure 2 shows the percentage of plate numbers issued from 2013 to 2015. The increased number of vehicles has attributed to the increased number of delays which has greatly increased traffic congestion in Nigeria.

IV. CONCLUSION

The analysis showed high level of traffic congestion in the cities of Nigeria which affect negatively the socioeconomic well-being of the citizens in the country. Also, there was significant indication that the number of vehicles in some States like Lagos, Edo and Osun states was higher than expected. It indicates that the western part of Nigeria experience huge congestion than other areas.

In the demographic analysis of the respondents, Respondents were asked to indicate their age bracket and below were their responses. Findings show that the number of respondents whose age lie between 20-30 years was 22 percent, those who lie between 31-40 years was 34.1 percent and those at 41years and above was 43.9 percent. There is respondent below 20 years recorded. Most of the respondents were above 40 years. This implies that most respondents that were interviewed were actually adults. Respondents were asked to indicate their profession and or Academic qualifications and below were their responses. The findings revealed that 39 percent of the respondents are diploma holders; 48.8 percent are degree holders while 12.2 percent are certificate holders. The findings therefore imply that the majority of the respondents were literate, since most of them attained qualifications at a higher education level.

It is largely the pain and agony of a failed public transport service, mainly offered by 14-seater owned mini buses that many Nigerians invest in, personal cars, resulting in traffic jams that cost the economy a whopping 500 million naira daily on burnt fuel. The jam also accounts for 30 percent of productive time lost daily; a situation worsened by most motor cycles, a popular alternative Nigerians use to fend off

jam in most situations. The Federal Road Safety Commission (FRSC) notes that second hand cars pose grave health and environment challenges than the new ones. That is to say; a second hand car's combustion efficiency is not as good as a new car's yet about 80 percent of the cars found in Nigeria are second hand cars.

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