

Full Length Research Paper

Influence of Roadside Friction on the Traffic Flow in Core North Western States

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ABSTRACT: A well-functioning transportation system is critical to the nation's economic development. The global urban transportation system is the driving force behind economic activity. In many developing countries, arterial roads have deteriorating capacity and performance. Various studies on this issue have been conducted in some developing countries, and it has been discovered that, as a result of urbanization, there is often a significant quantity of activity on and alongside these roadways, affecting how they operate. "Side friction" refers to the disruption of the smooth flow of traffic. The speed of vehicles on the road, the width of the road, the structure of the road, road construction work (e.g. work for Metro Rail construction), various land uses that attract motorized / pedestrian traffic bound to hospitals, institutional, commercial areas, shoulder and roadway width, access points, terrain, and

other factors all influence urban roadway capacity. However, side frictions such as bus stops, encroachments, on-street parking, pedestrian crossings, and entry and exits from major roadways have a considerable impact on urban roads. The purpose of this article is to investigate the impact of side friction generated by market activities on chosen roads in the main north western states of Sokoto, Kebbi, and Zamfara. In this study, the reconnaissance survey, observation, and interview were used. The majority of the traffic congestion was discovered to be caused by commercial activity along the roadside. I believe that a market should be erected along trunk road B to reduce traffic congestion.

Keywords: Commercial activities, congestion, friction point, markets, transportation

INTRODUCTION

According to Gbadamosi (2004) reported that, the significant importance of transportation in daily activities of human being, and it is difficult to conceive a situation where transportation does not play significant role in the life of any individual. Therefore, transportations help in the achievement of the basic objectives of living in the city which involves the functional efficiency of land uses, services and improvement, infrastructure in the quality of life. The horizontal and vertical spreads of any city are dependent on the nature and function of transportation system. Market according to world bank (2009) is described as any institutions, system, social relations, procedures and infrastructure put in place to enable businesses sell their goods, services and labor in exchange of money to people. Market is essential in the economic life of the people, and they are indispensable in the distribution of commodity.

However, commercial activities are essential in the sustenance of any town or city of today, which however makes market indispensable. Transaction between people is expedient because it makes life go on (Fakere and Fadamiro, 2012). It is also a location where economic desires can be realized (Callon 2003). Muli (2007) defines markets as an organization that allows buyers and sellers to trade products and services, as well as a regular gathering location for the aim of purchasing and disposing of locally produced or imported commodities and services. Traditional and modern markets are divided into two categories based on the commodity of speciality, services given, location, duration of operation, and physical surroundings, among other factors (Cooper, 2008). As a result, markets are classified as daily, periodic, and extraordinary (Bromley, 1971). According to Fadamiro (2005), the rapid proliferation of urban canters has resulted

in a slew of management issues, some of which can be traced back to the beginning. The invasion of open market places, as well as health-related issues like as solid waste management, water supply, traffic congestion, housing, and water contamination, are the most pressing of these difficulties. According to Fadamiro (2005), one of the most serious problems confronting Nigerian cities today is the encroachment of market centers on open spaces on the road. It is consequently critical to recognize that these difficulties can be attributed to poor market environment planning.

Many markets pop up haphazardly near main roads in cities, obstructing free flow of traffic and so compromising urban functionality and aesthetic aspects. Fakere and Fadamiro (2012) also showed that proper market seating and design will greatly portray the image of the city while also allowing free flow of commercial activity. According to Adebisi (2011), traders who display their things by the roadside for the advantage of road users who are on the lookout for items placed along the road and motorists who frequently park indiscriminately during the purchase of items from the sellers contribute to congestion. Congestion has a wide-ranging impact. Some indirectly while some are directly, such as the impact of motorists' sense of wellbeing, be it times wasted sitting in a traffic queue and changes in the behavior of drivers, such behavior might include rude gestures, verbal insults, deliberately driving in an unsafe or threatening manner, or making threats. This can escalate to further conflicts, attacks, and crashes, which can end in injuries and even death.

Other consequences include missed appointments, increased gasoline use resulting in a higher cost, lost productivity combined with a high level of stress, and so on. That is why, in order to minimize the aforementioned difficulties, a research of side friction on the core northwestern states was done. According to Hougendoorn (2001), there are two major categories of causes of congestion: (a) micro level variables (e.g., traffic on the road) and (b) macro level ones (e.g., overall demand for road use). Congestion is "triggered" at the "micro" level (for example, on the road) and "driven" at the "macro" level by factors that contribute to the incidence and severity of congestion. Many people and freight want to move at the same time, for example, and there are too many automobiles for limited road space. Many trips may be delayed by irregular but frequent events such as accidents, vehicle breakdowns, poorly timed traffic signals, special events such as mass social gatherings, political rallies, bad weather conditions, and so on, all of which present factors that contribute to a variety of traffic congestion problems. On the other hand, macro-level issues such as land-use patterns and so on might cause congestion. Using the triple bottom line" approach which comprises economic, environmental and social value. The Greater Toronto Transport Authority (2008) categorized the costs of traffic congestion into five major clusters as follows:

Excess time delay – automobile users

Longer travel times result in a cost to motorists in the form of value placed on this excess time spent travelling. This is referred to as an opportunity cost" which is equivalent to the value of activities forgone. The added unpredictability of travel time is included in this cost. There is also the associated inability to forecast travel time accurately, leading to drivers allocating more time to travel "just in case", and less time on productive activities.

Excess time delay – transit, public and private users

For transit operations occurring on shared roadways, these transit users experience a cost of excess travel delay in the same form as automobile users.

Increased vehicle operating costs

Vehicle operating costs increase in congested traffic conditions due to the stop-and-go nature of travel; wear and tear on vehicles as a result of idling in traffic and frequent acceleration and braking, leading to more frequent repairs and replacements. Additionally, high traffic volumes represent operating costs in excess of the socially optimal level.

Excess accident externality costs

Congested traffic conditions result in a higher accident rate, which translates into additional costs to automobile users.

Excess vehicle emissions externality costs

Vehicle emissions, like operating expenses, rise with congestion due to stop-and-go driving circumstances, and the total amount of emissions is inefficiently high due to excess traffic volume. In addition to the direct costs that harm motorists, excessive congestion has an indirect cost on the economy as a whole. Congestion costs raise the cost of economic activity because of 1) the direct rise in transportation expenses and 2) the negative influence on the labor market, as greater commuting costs result in higher pay and less demand for labor, resulting in a suboptimal allocation of labor resources. The end result is that overall economic output (measured by GDP) will be below the level that would exist in the absence of congestion. Further, excess congestion results in higher transportation and logistics costs for various industries, due to the higher direct costs of transportation (fuel expenses, labour costs, maintenance, etc.) and several direct costs such as the need to maintain higher levels of inventory as a buffer against delivery time reliability, a higher frequency of missed deliveries, and so on. These effects serve to both increase costs and decrease

revenue, with a concomitant reduction in employment. According to Hougendoorn (2001), urban environment dependency has reached a point where 30 to 60% of urban areas are taken over by road transportation infrastructure in an attempt to convey a high level of accessibility to respond to vast areas' mobility demand and create an enabling ground for commercial activities and accommodation. Whereas the majority of commercial hubs, such as markets and banks, exacerbate the problem on the ever-busy highways. When roads are built, they are usually to service a particular land-use such as housing, factories or farms. However, land – use can change overtime. When roads are used for a purpose that they were not built for, they can become inefficient and dangerous, even planned land uses, such as commercial activity, can outgrow a site and spread onto adjacent land, including road space, (Charles and Robin, 2012). Roadside activities are more noticeable in regions with heavy traffic flow. In Nigeria, street hawking and petty commerce disrupt traffic flow in areas where effective discipline measures cannot be implemented. When vehicles try to catch a glimpse of exhibited objects for sale, or when hawkers draw their attention to items for sale, traffic flow is disrupted. This causes driver distraction, which may result in a reduction in speed when the stream is moving or a delay in progress when the stream has slowed. The traffic flow parameters may be impacted in either circumstance. According to Mahamuda et al. (2018), most transport routes, particularly roads, have a tendency to attract human activities to areas within their proximity, because these activities have a comparative advantage when located within areas of easy and thus cheap access to the transport system, which translates to increased profits (for commercial and industrial activities) due to the lower cost of travel and more clientele, which includes the everyday user. This study aims to determine the extent to which traffic flow is impacted when market activities are the primary sources of side friction in the Core North Western States. Congestion, delays, and increased travel time may result from traffic flow issues related with market operations. Due to insufficient land capacity in some of our markets, prospective traders must use alternate spaces such as road sides and others.

The aim of this research is to examine the effect of side friction caused by market activities on the core north western states. To achieve the aim below are the objectives:

1. To study commercial activities in the study area
2. To determine if relationship exist between market location and traffic flow in the area
3. To generate traffic data on some of the affected roads
4. To determine whether the commercial activities have distracted the drivers

METHODOLOGY

The following methods were adopted in meeting the objective of this study.

Data collections

For this research, reconnaissance survey, observation, interview and traffic volume count were adopted.

Reconnaissance survey

The field trip to the research areas, so as to identify areas where markets have been located was done. The identified roads were further scrutinized to have roadways that met the study objectives, these included roadways where road side activities markedly affected traffic flow. The roadways that met the criteria for this research are on the trunk road A due to the presence of markets.

Observation

This observation was used during data collection in which both the traffic flow, driver distracted and roadside activities were fully observed on the affected roads, however most of the roadside activities were trading activities, hawking street trading, and loading/offloading of goods and services.

Interview

This was conducted during data collection in which some traders and also some of the drivers were interviewed about the nature of their business and the road itself. Pictures were taken in all the affected roads for further clarification and understanding of the nature of roads and traffic flow due to the businesses activities.

Traffic volume count

This also was taken and recorded to enhance the true understanding of the volume of traffic, nature of traffic flow and the driver distracted on these affected roads were all examined and recorded in six months' period.

Need for road side activities

In most countries, both developing and developed ones, activities in the informal sector were not included in national employment statistics (Suhatto, 2002). In an attempt to bring this sector to national attention as well as to reduce the concern over high unemployment the inclusion of the sector in national figures has now become a common feature in many developing and developed nations alike.

Table 1: Result of Pie charts of the various sites

Site	Tricycles	Motorcycles	Cars	Light/Medium Vehicles	Heavy Vehicles	Total Traffic
Illela	12°	65°	79°	174°	30°	1540
Sokoto C/ Market	7°	95°	90°	135°	33°	2737
Dodori	8°	44°	89°	141°	78°	2492
Maga	12°	93°	96°	87°	72°	2299
K/Namoda	14°	64°	105°	127°	50°	2013
Shinkafi	6°	165°	95°	62°	32°	4116
T/Mafara	8°	197°	110°	28°	17°	2330
K/Daji	4°	239°	52°	28°	37°	3627

RESULTS AND DISCUSSION

Value of Passenger Carrying Unit (PCU). PCU values are employed as a multiplication factor issued by a Great Britain, according to the Cycling Embassy of Great Britain (2021).

- 1. Bicycle- 0.3
- 2. Tricycle- 0.5
- 3. Motorcycle- 0.33
- 4. Passenger cars- 1.00
- 5. Light/Heavy Vehicles- 2.00
- 6. Heavy Vehicles- 3.00

Average Hourly Traffic Flow (AHTF)

$$AHTF = \frac{\text{Total number of vehicle}}{\text{Total hours}}$$

Calculation and drawing of pie-chart

The total number of traffics been calculated using the PCU values were used in the calculation and drawing of pie chart, so that the results can be easily read and understood (Table 1).

Observation

During data collection in Sokoto, Kebbi and Zamfara States, the followings were noted.

Sokoto State

At sokoto central market there was congestion as a result of people selling perishable on the road and the Taxes/ Tricycle drivers that were loading /offloading of passengers, but these occurred mostly around 5; 00pm till

after the closing time of the market, the congestion became severe when the market was closed due to the additional traders trying to reached their destinations with their mobility, this is in line with Adebisi (2011) showed that displacement of goods by the road side can results to congestion problems. At Illela town the market is situated not on the main road but still a time congestion occurred on the main road due to the massive movement of people from and into the market more especially when trucks were packed on the road shoulder for loading of goods, the congestion occurred frequently throughout the day. However, there was traffic control personnel that was controlling the traffic. In Wamako the conjunction was rear because the traders were not allowed to dispatch their goods on the road/road shoulder till evening time (Figures 1 and 2).

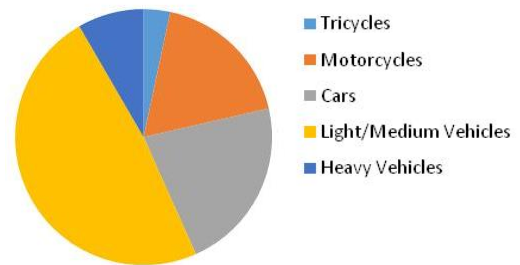


Figure 1: Pie-Chart of Konni Road Illela, Sokoto State.

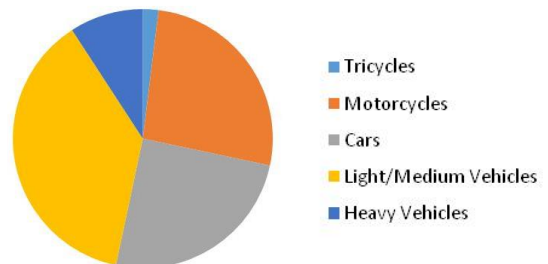


Figure 2: Pie-Chart of Sokoto Central Market, Sokoto State.

Kebbi State

Dodori market is a big market located by the road side along Jega road, the condition of the market was trouble, because the market has saturated that forced some traders to dispatched their goods on the road/road shoulder, the motor park station is located in the opposite sit but still vehicles were park on the road shoulder, also loading/offloading were taken placed on the road, as a result of that the congestion occurred almost all the time, it is in line with Charles and Robin (2012) reported that commercial activities can outgrow a site and spread into adjacent land. The situation remains the same at maga market located along Zuru road. At Jega market located along Yawuri road the situation was different because no display of goods on the road and there is motor park station beside the market, the only problem is the parking of vehicles on the road/road shoulder, therefore the congestion was also rear (Figures 3 and 4).

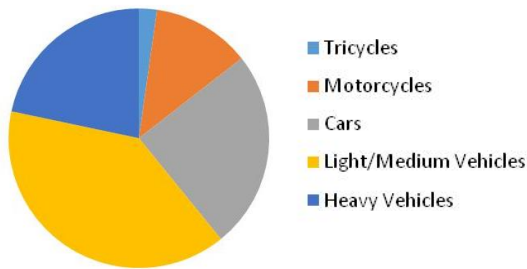


Figure 3: Pie-Chart of Jega Road-Dodori, Kebbi State.

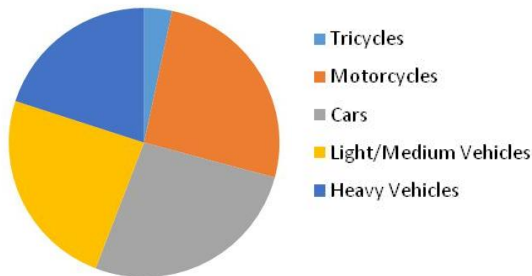


Figure 4: Pie-Chart at Zuru Road-Maga, Kebbi State.

Zamfara State

The nature of the Kasuwar Daji market along Kaura Namoda road and Shinkafi market along Kaura Namoda road were almost the same but loading/offloading were

more severe at kasuwar Daji market than Shinkafi market however the dispatching of goods on the road was much in Shinkafi market than kasuwar Daji market, also both they have motor park station at their beside but the congestion problems were much in kasuwar Daji than Shinkafi market because there is dual carriage way in Shinkafi that leads to the reduction of the congestion. In Tsafe market located along Gusau road the market is small that cannot accommodate all the traders that is why some trades were displayed their goods on the road/road shoulder, the cases of loading/offloading were very rear but still congestion was occurring, it is in line with Fademiro (2005) reported that market can outgrowth to open spaces. At Talata Mafara market the market is far away from the road so the spreading of goods on the road was not significant but still loading/offloading on the road were taken placed which leads to the occurrence of congestion. At Kaura Namoda market along Gusau road some traders were dispatching their good on the road/road shoulder, also loading/offloading were taken placed on the road shoulder and even the road itself, these lead to the occurrence of congestion and it is consistent with Fakerr and Fadamiro (2012) that congestion will affects the free flow of traffic (Figures 5-8).

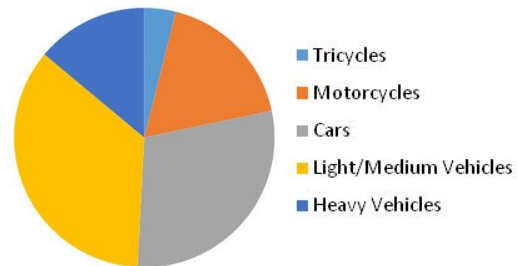


Figure 5: Pie-Chart at Gusau Road, K/Namoda Zamfara State.

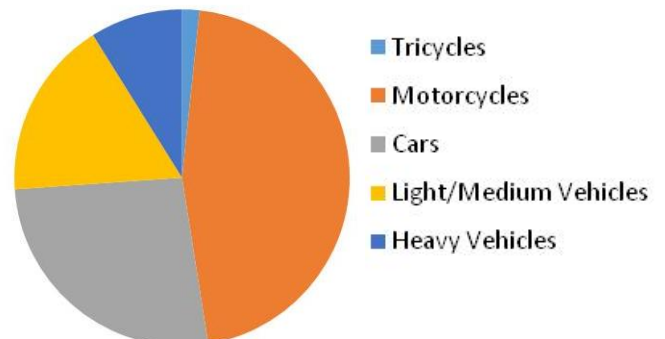


Figure 6: Pie-Chart at K/Namoda Road Shinkafi, Zamfara State.

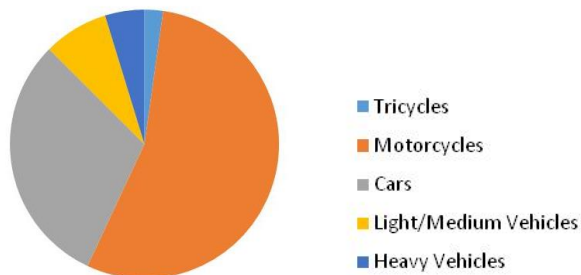


Figure 7: Pie-Chart at Sokoto Road Talata Mafara, Zamfara State

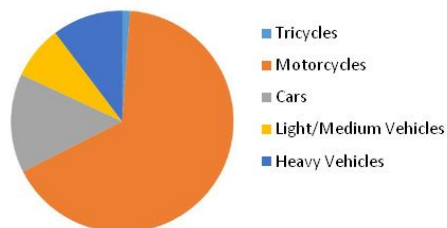


Figure 8: Pie-Chart at K/Namoda Road K/Daji, Zamfara State

Interview

When we queried the individuals around us, the drivers and the traders, about the nature of the road, the challenges of loading/unloading products and services, the congestion problems, and the market conditions, they all said that was how the roads and markets were during market days, and accidents did happen. That is why drivers, particularly private drivers, attempted to cross the roads before peak hours in order to avoid congestion problems, which could result in many of the problems outlined in the literature. The people very close to the markets were mostly using motorcycles for their transportation to and fro to markets. However, considering the pie chart diagram the light/medium vehicles have the largest value followed by cars, motorcycles, heavy vehicles then lastly tricycles in most of the results, this indicated that, the tricycles were less important for both the traffic flow and the design of the road pavement, since during design we make use of the data for critical condition to design any structures like road, therefore since the light/medium vehicles have the largest number its helps a lot in the design of good quality roads, so that to avoids failure that can arises during the life time of the roads, that

is why all the roads were of good quality and sound during the periods of conducting this research work. There are traffic control personnel in Sokoto and Zamfara states, excluding Kebbi state; we also witnessed some few accidents in Dodori market, Shinkafi market and Tsafe market respectively.

Conclusion

The following conclusion can be drawn from the findings, the commercial activities of the study areas are almost the same for all the states and comprise of trading, hawking, loading and offloading of goods and services and stalls, on street parking, parking manoeuvre. There a lot of relationship between market location and traffic flow in all the areas, this leads to occurrence of traffic problems such as congestions, delays, accidents, waste of time, money and opportunities. Therefore, the nature of traffic flow was not a free flow more especially during peak hours. Considering the pie chart diagram, the light/medium vehicles have the largest value followed by cars, motorcycles, heavy vehicles then lastly tricycles in most of the results, since the light/medium vehicles have the largest number its helps a lot in the design of good quality roads. The commercial activities have significantly distracted the drivers more especially the hawking and displaced items on the road shoulder that leads to congestion and accidents.

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