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The Effect of Traffic Congestion on Travel Time in Lagos- Nigeria.

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ABSTRACT
This study investigates the effects of traffic congestion on travel time along Badagry express road , Lagos. Among the objectives were to determining the speed, travel and delay time, determining the difference between car travel time and also examining the causes and impact of traffic congestion on travel time. Descriptive statics was used to acquire average speed, travel and delay time. Four hundred (400) copies of questionnaire were administered to drivers and passengers of (cars and buses). The speed, travel and delay time for the study area revealed low speed and increases in travel and delay time during the morning and evening peak periods. The study also revealed the main causes of traffic congestion along the corridor are inadequate road capacity. The social impacts of congestion on travel time are unpredictable travel time in the study area with 61% and extra time with 46.6%. Economic impact revealed fuel consumption as highest with 51% along corridor and working hour is reduced were the highest with 50%. Delay experienced due to traffic congestion showed that 98% of the respondents acknowledge that traffic congestion brings about delay.
The study recommendations among others, decentralization of government offices to reduce influx of worker into the area. Provision of an affordable and functional mass transit vehicles to provide alternative use of private vehicles, will help in reducing the number of vehicles on the corridors by the state government.
Key word: Traffic; Congestion; travel time; Urbanization; Transport.

I. INTRODUCTION

Urbanization has become not only a principal manifestation but also an engine of change, and the 21th century has become the centre of urban transition for human society. In a way, urbanization is desirable for human development; however, uncontrolled urbanization has been responsible for many of the problems cities experience today, resulting in substandard living environment, acute problems of drinking water, noise and air pollution, disposal of waste and traffic congestion[14]. Cities with one million people and above, according to the United Nations forecasts increased to over 300 by the year 2000 in the developing world, this trend will continue because of the rapid growth in population, resulting from improvement in health services and the multifarious functions performed by cities, which have been another major attractive force. The situation as described above has its impact on traffic in the cities of developing world. Thus, the activities make them generators and attractors of traffic, which of course has implications on mobility[6]. Thus, recent efforts have focused on tools and techniques scientists and practitioners could employ to address these challenges and to aid planning and decision-making[1]. Traffic congestion is a phenomenon associated with urban environment all over the world; this is because people need transport to move from one place to another, especially when trekking becomes inefficient. Congestion is a complex and multidimensional phenomenon that is difficult to mitigate. The proximate causes of congestion are numerous examples too many vehicles for a given roadways design, dynamic changes in roadway capacity caused by lane-switching and car-following behavior and are invariably linked to other factors such as land-use patterns, employment patterns, car ownership trends, road infrastructure investment and regional economic dynamics, Organization for Economic Cooperation and Development/European Conference of Ministers of Transport[3]. Traffic

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congestion is one of many serious global problems in both developed and developing countries. It exerts a negative externality upon the society, causing severe threat to the economy as well as the environment[5]. In the United States, road congestion now causes commuters to spend an average of a full work week each year sitting in traffic[13]. Still in the United States, factors which include rapid population, job growth in metropolitan areas and more intensive use of automobiles which are deeply embedded in American culture have led to traffic congestion[2].

The issue of traffic congestion has affected both the developing and developed economies at different degrees irrespective of the measures taken to curb it. Traffic congestion can be seen to have substantial negative effects on urban residents and organizations. Congestion impacts include loss of productivity and restricted accessibility in the urban environment. At first glance, it would seem that urban traffic congestion would have less impact on travelers and organizations outside the metropolitan area, but congestion on roads has resulted in massive delays, increased fuel wastage and monetary losses[4]. In the study conducted by the Texas Transport Institute[12], congestion was said to have caused the United State of America's economy 3.7 billion hours of travel delay and 8.7 billion liters of wasted fuel. In the United Kingdom, the Commission for Integrated Transport notes that while drivers in Central London spend up to about 50 % of their time crawling in jammed traffic, businesses in the city are also losing about £2 million a week.

African cities particularly Nairobi (Kenya), Kampala (Uganda), Lagos (Nigeria), are noted for notorious traffic congestion; heavy traffic jam, while motorists and commuters contend with extreme heat, air and noise pollution[8].

Nigeria's traffic congestion in major cities has remained part of the operating transportation system especially during the morning, afternoon and evening peak periods. As noted by,[7]. The problem of traffic congestion is no longer limited to traditional cities such as Lagos, Ibadan, Benin-City, Port Harcourt, Abuja, Kano and Lagos[10]. Traffic congestion has been one of major issues that most metropolises are facing and thus, many measures have been taken in order to mitigate it. It is believed that identification of congestion characteristics is the first step for such efforts since it is an essential guidance for selecting appropriate measures[11]. The problem of traffic congestion on commuters along Badagry express way has been persistent with every administration making efforts to tackle it. The intercity railway network to assist in the movement of people from one end of the state capital to the other in order to reduce the effects of congestion on road users. Yet the problem of traffic congestion still persists within the city.

This research seeks to assess the effects of traffic congestion on commuters' travel time along Badagry Express Way, Lagos. This will then be achieved through highlighting the congested locations in the study area, determine the speed, travel and delay time for each segment of the corridors, determine the difference between car travel time in the different segment and car and bus in the same segment of the corridors and lastly examine the causes and impact of traffic congestion on travel time.

II. MATERIAL AND METHODS

A reconnaissance survey of the study area was done which helped in identifying the congested corridors.Questionnaire and travel time data which include the speed and travel time were the primary source of data while Journals, thesis, internet, newsletter and other published and unpublished materials were used as reference materials for the study as the secondary source. The data required include:

i. Corridors length/width
ii. Travel and delay time for each of the corridors
iii. Speed and distance for each of the corridors
iv. Socio-demographic characteristics of respondents
v. Impact of traffic congestion on travel time within the corridors

Methods of Data Collection

As a result of the type of data required, which is mainly primary data source, the data were gotten through field survey. Field survey was used to identify the land use pattern, travel time and distance or length of each of the route, road complimentary facilities and design and capacity of road surface. The travel time survey was carried out with the use of both private cars at morning peak hour of 7:00am – 9:00am when civil servants, business men and women, and students are all leaving their homes for their daily activities and at the off-peak period of 9:00am – 4:00pm when traffic is less. Alsoin the evening peak period when civil servants, business men and women are returning home from their daily activities. The selected routes are marked out for

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traffic counts, from 7am to 6pm for a period of one week, to know the traffic flow in the area.The population of the study were all vehicles that pass through the routes during the period of the field survey, all roads complimentary facilities on the study routes, design and capacity of road surface of the study routes, and also land use type along the study routes.

III. RESULT

Analysis was done on the congested corridors, determining the speed, travel and delay time and the average speed and average travel and delay time were determined. Finally, the causes and impact of traffic congestion on travel time was analyzed using;volume and composition of traffic, flow rate and travel time variability at peak and off - peak periods.

(a) Volume and Composition of Traffic

Table 1 shows the daily inflow of vehicular traffic volume and composition from the field survey carried out from 7:00am to 6:00pm along corridor was corridors for seven (7) days. It was observed from Monday to Sunday, that Cars constitute the highest proportion of vehicular traffic numbering a total of 15,634 representing 76.17% of the vehicular flow followed by Tricycles numbering a total of 1,798 representing 8.76% of vehicle flow. This could be due to the barn on Commercial Motor Cycle in January 2014. The vehicle type with the least number was Big Buses which is due to the fact that they enter into the town in the earlier hours of the day since they embark on night journeys. Friday recorded the highest number of vehicular traffic with 3,859 vehicles, due to the fact that those at home that wouldn't go out for work, business, shopping etc will go out to observe the Friday Juma'at prayers. The seven (7) days (Monday to Sunday) recorded a total of 20,526 inflow volumes and composition of vehicles.

Table 2 shows the daily outflow of vehicular traffic volume and composition from the field survey carried out from 7:00am to 6:00pm along Badagry express way in Lagos for seven (7) days. It was observed from Monday to Sunday, that Cars constitute the highest proportion of vehicular traffic, numbering a total of 15,502 followed by Tricycles numbering a total of 1,796, representing 75.2% and 8.71% of total vehicle flow respectively. Friday recorded the highest number of vehicular traffic 3656, followed by Wednesday 3358. The seven (7) days (Monday to Sunday) recorded a total of 20,617 outflow volumes and composition of vehicles.

All the data especially for Monday and Tuesday and for big buses and trailers would have been more but because the survey was done the week after the presidential election and so many people did not go out.

Table 1: Inflow volumes and composition of traffic along the corridor Y

VOLUME AND COMPOSITION OF TRAFFIC											
Days	Cars	Taxis	Mini buses	Midi buses	Big buses	Pick-up	Trailers/ Tankers	Lorry/ trucks	Motor cycles	Tricycles	Total
Monday	2313	92	127	6	1	108	6	8	107	273	**3041**
Tuesday	2393	86	138	2	-	98	5	9	117	249	**3097**
Wednesday	2245	89	101	4	-	134	3	8	115	253	**2952**
Thursday	2474	90	125	5	1	87	3	5	92	257	**3139**
Friday	2956	115	111	3	-	79	5	4	270	316	**3859**
Saturday	1587	82	140	3	-	79	7	3	114	250	**2265**
Sunda	1666	75	78	3	-	60	1	2	91	200	**2176**

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y											
Total	15634	629	820	26	2	645	30	39	906	1798	20526
(%)	76.17	3.1	3.99	0.13	0.009	3.045	0.15	0.19	4.414	8.76	100

Source: Authors Field Survey September, 2021.

Table 2: Outflow volume and composition of traffic along Corridor X

Days	Cars	Taxis	Mini buses	Midi buses	Big buses	Pick-up	Trailers	Lory	Motor cycles	Tri cycles	Total
Monday	2445	107	149	5	-	95	5	5	118	284	**3177**
Tuesday	2269	96	133	3	-	102	4	9	112	251	**3279**
Wednesday	2596	98	91	4	1	144	3	8	126	287	**3358**
Thursday	2401	101	133	3	1	80	2	6	104	253	**3084**
Friday	2780	123	102	3	-	70	4	4	269	301	**3656**
Saturday	1576	76	98	8	1	71	4	6	91	234	**2165**
Sunday	1435	58	67	2	-	56	1	5	87	186	**1898**
Total	**15502**	**659**	**773**	**28**	**3**	**618**	**23**	**43**	**907**	**1796**	**20617**
(%)	75.2	3.2	3.74	0.14	0.015	2.99	0.112	0.21	4.39	8.71	100

Source: Authors Field Survey September, 2021.

(b)Flow Rate

Table 3 shows that traffic is high during the morning and evening peak periods of 7-9am and 4-6pm. 7-8am recorded the highest traffic of 2333, followed by 5-6pm with 2331vehicles. The lowest traffic was recorded during the hour of 11am-12noon probably due to the fact that Sun will be at its peak at that time of the day.

Table 3: Analysis of hourly inflow of Vehicular Traffic flow along the corridor

Time of day	**Cars**	**Taxis**	**Mini buses**	**Pick-up**	**Trailers**	**Lorry**	**Motor cycles**	**Tricycles**	**Traffic Vol./hr**
7-8am	1823	87	108	21	3	3	92	193	**2333**
8-9am	1709	81	102	20	3	3	98	184	**2203**
9-10am	1521	54	79	55	3	2	74	163	**1953**
10-11am	1054	43	67	53	-	4	67	140	**1430**
11-12noon	908	27	71	52	-	3	75	144	**1282**
12-1pm	1407	49	85	50	2	2	82	164	**1844**
1-2pm	1467	45	77	48	1	1	91	170	**1903**
2-3pm	997	34	86	60	-	2	61	115	**1357**
3-4pm	1345	46	57	86	5	5	78	137	**1761**
4-5pm	1602	81	47	102	6	6	96	190	**2132**
5-6pm	1801	82	41	98	7	8	92	198	**2331**
Total	**15634**	**629**	**820**	**645**	**30**	**39**	**906**	**1798**	**20526**

Source: Authors Field Survey September, 2021.

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Table 3 shows that traffic is more during the morning (7-9am) and evening (4-6pm) peak periods. For Cars, the highest traffic of 1928 and 1778 was recorded during the evening peak periods of 5-6pm and 4-5pm respectively while the morning peak period recorded 1917 between 7-8am and 1769 between 8-9am. The studied routes have high volume of traffic thereby causing congestion even though some other factors are also contributing to the congestion. The traffic on the route is composed of mostly private vehicles usage.

Table 4: Analysis of hourly outflow of Vehicular Traffic flow along the corridor.

Time of day	Cars	Taxis	Mini buses	Midi buses	Pick-up	Trailers	Lorries	Motor cycles	Tri cycles	Total
7-8am	1917	82	108	5	23	4	10	128	229	**2506**
8-9am	1769	75	97	3	26	3	6	122	212	**2313**
9-10am	1209	55	67	2	30	3	5	106	176	**1653**
10-11am	1023	42	61	2	48	1	2	47	124	**1350**
11-12 noon	1001	40	45	2	51	-	-	56	111	**1306**
12-1pm	1289	56	85	4	62	-	-	67	158	**1721**
1-2pm	1315	58	73	4	65	1	-	58	162	**1736**
2-3pm	1140	47	46	1	71	1	3	25	95	**1429**
3-4pm	1133	47	49	2	75	2	4	56	101	**1469**
4-5pm	1778	77	63	2	80	4	6	115	201	**2363**
5-6pm	1928	80	79	1	87	4	7	127	227	**2543**
Total	**15502**	**659**	**773**	**28**	**618**	**23**	**43**	**907**	**1796**	**20389**

Source: Authors Field Survey September, 2021.

(c) Travel Time Variability at Peak and off -Peak Periods

Table5 shows the travel time variability at peak and off-peak periods along corridors. The available tools that was used during the survey to measure the travel time variability was communication with the use of stopwatch at the two ends of each of the study area for Midi buses, Big buses, Trailers/Tankers and Lorry/Truck but for Cars, Taxis, Pick-up, Motor cycles and Tricycles, the field survey official boarded each from one end of the route to the other end using his stopwatch at both peak and off-peak periods. It was observed that Motor cycles travel at the highest speed of 35km/hr followed by Cars, Mini buses and Pick-up trucks at 30km/hr. Trailers/Tankers and Lorry travel at the lowest speed of 20km/hr. Taxis and Tricycles travel at the speed of 23km/hr and 25km/hr respectively because of the stops they make to pick and/or drop-off passengers. It was observed from the field survey that, there is time and speed difference between vehicles and at peak and off-peak periods. The differences are attributed to peak and off-peak periods. Generally, vehicles move faster at off-peak periods than during peak periods. The time spent within the study areas at peak and off-peak periods for Taxis and Three wheelers is generally high due to stoppage at intervals to pick or drop-off passengers.

Table 5: Travel time variability at peak and off-peak periods along the corridor

Vehicle type	Average Morning and Evening Peak Journey Time (min)	Average off-peak Time (min)	Average Speed (Km/hr.)
Cars	7.9	4	30
Taxis	10	6	23
Mini Bus	7.9	4	30
Midi Bus	8.5	5	25

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Big Bus	9	5	25
Pick-up	7.9	4	30
Trailers/Tankers	13	7	20
Lorry/Truck	13	7	20
Motor Cycles	6.5	3.5	35
Tricycles	8.5	5	25

Source: Authors Field Survey September, 2021.

IV. DISCUSSION

From the analysis, the study has pointed out some significant findings useful for urban transport planning within the specifically in the study area. ;

i. It was discovered that there are no off-street parking facilities within the study areas.
ii. It was discovered that on street parking constitute a major hold-up along the two study areas.
iii. It was discovered that there is over dependence on personal vehicle use because of lack of adequate of public transport.
iv. It was equally discovered that picking and dropping-off of passengers by Taxis and Tricycles along the study route constitutes major traffic delays.

Recommendations

In light of the problems identified and the overall findings of the study, the following recommendations were made;

i. Provision of an affordable and functional mass transit vehicles to provide alternative use of private vehicles, will help in reducing the number of vehicles on the corridors by the state government
ii. On-street parking should be ban along the route.
iii. Off-street parking facilities or areas should be provided along the routes.
iv. Pedestrian walkways should be constructed along the routes.
v. Traffic Demand Management (TDM) should be improved upon along the route.

V. CONCLUSION

Traffic congestion has been a problem in the study area with morning peak periods of 7-10am, afternoon peak period of 11am-2pm and evening peak period of 3-6pm while inadequate road capacity is a major cause. Unpredictable travel time, fuel consumption and working hours is reduced are the major impact felt It is believed that if the recommendations made are fully implemented by the policy makers, they will surely enhance the free flow of vehicle decrease in travel time on the selected routes and some other routes in Lagos State.

Vehicular traffic speeds and travel time in the metropolis can effectively be managed if the government can invented into the application of the GPS in a probe vehicle and GIS. Mapping of the situational road traffic speed brings out the desired geographic patterns and relationships which are fundamental decision making tools for the management of traffic system.

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