



## Traffic Count on Ikorodu-Sagamu Road as an Index for Traffic Flow in Ikorodu

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### ABSTRACT

Consequence of the importance of road in national development and the fact that roads with larger traffic volume are usually given priority by government because of their economic implication, the traffic flow along Ikorodu-Sagamu Road was investigated using traffic count. The traffic count took place from Monday 17th to Sunday 23rd September, 2012. Hourly average each day were 2417, 2053, 1839, 1566, 1876, 1292 and 854 respectively. The hourly probability distributions which range between 0.05 and 0.13 were also illustrated. The result showed that the traffic volume was high in the morning for all working days except Thursday but relatively low in the afternoon for all days. The traffic volume increased again in the evening for all days. The correlation coefficients relationship amongst days indicated both positive and negative coefficients separately for the paired-days. The correlation coefficients values ranges from -0.04 to +0.92. The study detailed flow pattern along the route which can be used in planning road movement by the road users.

**Keywords:** Vehicles, Traffic, Index, Flow, Analysis.

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### I. INTRODUCTION

At the very basic level of infrastructure provision, it is undeniable that transportation is indispensable to modern economic development especially in a developing country like Nigeria. Vehicular traffic census like the population census is a phenomenon which helps the government in developmental planning. The volume of vehicular traffic on a particular route is by implication an indication of the number of people and the volume of goods being transferred along the route. Ideally, this determine the position of the road on the preferential scale for development such as grading, surfacing and expansion, introduction of flyover construction for vehicles and /or pedestrians, and construction of bye-passes to ease or avoid traffic congestion. This is demonstrated in the National Development Plan periods of 1962-1968, 1970-1974 and 1975-1980 where 65.4%, 77.4% and 85.3% respectively of public expenditure in the transportation sector were allocated to road and rail development programmes. It is reported that greater proportion of this investment was in road development projects [1]. Similarly, the quantum of pollution in the form of noise and air pollution from vehicular fuel combustion could be inferred from traffic census. It has also been established that vehicles account for 4.7% of total worldwide pollution [2]. It is also reported that transportation fuel combustion account for 27% of 3.3 billion tons of CO<sub>2</sub> release annually [1].

Road development would aid technical and economic development. Small scale industries such as vulcanizer, automobile mechanics and rewires are established near and along the route. Spare parts shops and filling stations could also spring up where the traffic is heavy.

The study area is a section of Ikorodu-Sagamu Road located in the northern part of Ikorodu It is within the Ikorodu North Local Government Area of Lagos State in Nigeria [3]. The study route covers from Ile-epo-Oba to Ikorodu garage rotary intersection and takes into consideration, the adjoining land uses. Ikorodu garage is a major Central Business District of Ikorodu serving as the socio-economic and cultural nerves of the city. It has greater access to pedestrians and vehicular transportation including terminals for both intra and intercity bus terminals. Ikorodu-Sagamu Road is dual carriageway from Lagos road end up to about 500m after Ile-epo Oba roundabout and single carriageway from this point to Sagamu. It is a major route into and out of Ikorodu town from Lagos to other states of Nigeria.

The objective of this paper is to find out the vehicular traffic volume and its flow pattern along Ikorodu-Sagamu road in Ikorodu, how this has affected movement of people, aided goods and service delivery and the environmental impact arising from the vehicular movement.

## II. RESEARCH METHODOLOGY

The traffic census was carried out when all primary schools, post-primary schools and the Lagos State Polytechnic were on vacation. Also no special festival was taking place during the census. The traffic census took place for seven days from Monday 17th to Sunday 23rd of September, 2012. On each day the census was done for 12 hours from 7.00 am to 7.00 pm. The station points were Ikorodu roundabout and Ile-Epo Oba junction.

Modus operandi adopted for the counting was manual counting. The approach of marking a vertical stroke of line on a paper designed and ruled for the census on hourly basis was used. At the end of the counting,, the tallies were added on hourly and daily basis. The results were finally analysed and compared using simple statistical principles.

## III. RESULTS AND ANALYSIS

The results of the traffic census for each of the days are as presented in Table 1 to Table 7. The Mean, Deviation, Variance, Standard deviation, Probability-Distribution and Correlation Coefficient were determined using the following formulae [4 and 5]:

$$\text{Mean, } \bar{X} = \frac{\sum X_i}{n}$$

$$\text{Deviation} = \sum (X_i - \bar{X})$$

$$\text{Probability - Distribution} = \frac{X_i}{\sum X_i}$$

$$\text{Variance, } S = \frac{\sum (X_i - \bar{X})^2}{n - 1}$$

$$\text{Standard Deviation} = \sqrt{\frac{\sum (X_i - \bar{X})^2}{n - 1}}$$

$$\text{Correlation - Coefficient } t = \frac{\sum [(X_i - \bar{X})(Y_i - \bar{Y})]}{\sqrt{\sum (X_i - \bar{X})^2 \sum (Y_i - \bar{Y})^2}}$$

The probability distribution values for the days are as indicated in Table 1 to Table 7. The Means, Deviations, Variances and Standard Deviations for each of the days are as presented in Table 8. Details of all correlation coefficients are as given in Table 9.

**TABLE 1: TRAFFIC CENSUS RESULT FOR MONDAY, 17/09/2012**

ith No.	Class Interval (Hrs)	Class mid point	No of Vehicles $X_i$	$(X_i - \bar{X}_1)$	$(X_i - \bar{X}_1)^2$	Probability $\frac{X_i}{\sum X_i}$	Cumulative Probability
1	7 - 8	7.5	2642	224	50,261	0.09	0.09
2	8 - 9	8.5	2773	356	126,473	0.10	0.19
3	9 - 10	9.5	2149	-269	72,205	0.07	0.26
4	10 - 11	10.5	2144	-273	74,502	0.07	0.33
5	11 - 12	11.5	1916	-501	250,851	0.07	0.40
6	12 - 13	12.5	2067	-350	122,731	0.07	0.47
7	13 - 14	13.5	1862	-555	307,925	0.06	0.54
8	14 - 15	14.5	2581	164	26,821	0.09	0.63
9	15 - 16	15.5	2585	168	28,227	0.09	0.71
10	16 - 17	16.5	2427	10	101	0.08	0.80
11	17 - 18	17.5	3078	661	436,802	0.11	0.90
12	18 - 19	18.5	2783	365	133,349	0.10	1.00
TOTAL			29008			1,630,248	
AVERAGE			2417				

**TABLE 2: TRAFFIC CENSUS RESULT FOR TUESDAY, 18/09/2012**

ith No.	Class Interval (Hrs)	Class mid point	No of Vehicles $X_i$	$(X_i - \bar{X}_1)$	$(X_i - \bar{X}_1)^2$	Probability $\frac{X_i}{\sum X_i}$	Cumulative Probability
1	7 - 8	7.5	2051	-2	4	0.08	0.08
2	8 - 9	8.5	2649	596	355,093	0.11	0.19
3	9 - 10	9.5	2527	474	224,673	0.10	0.29
4	10 - 11	10.5	2139	86	7,402	0.09	0.38
5	11 - 12	11.5	2008	-45	2,061	0.08	0.46
6	12 - 13	12.5	1680	-373	139,087	0.07	0.53
7	13 - 14	13.5	1605	-448	200,886	0.07	0.60
8	14 - 15	14.5	1480	-573	328,654	0.06	0.66
9	15 - 16	15.5	1779	-274	75,275	0.07	0.73
10	16 - 17	16.5	2200	146	21,450	0.09	0.82
11	17 - 18	17.5	2437	384	147,377	0.10	0.92
12	18 - 19	18.5	2083	30	891	0.08	1.00
TOTAL			24637	1,502,853			
AVERAGE			2053				

TABLE 3: TRAFFIC CENSUS RESULT FOR WEDNESDAY, 19/09/2012

ith No.	Class Interval (Hrs)	Class mid point	No of Vehicles $X_i$	$(X_i - \bar{X}_1)$	$(X_i - \bar{X}_1)^2$	Probability $\frac{X_i}{\sum X_i}$	Cumulative Probability
1	7 - 8	7.5	2704	865	747,697	0.12	0.12
2	8 - 9	8.5	2375	536	287,398	0.11	0.23
3	9 - 10	9.5	1870	30	929	0.08	0.31
4	10 - 11	10.5	1808	-31	961	0.08	0.40
5	11 - 12	11.5	1446	-394	154,862	0.07	0.46
6	12 - 13	12.5	1330	-509	259,147	0.06	0.52
7	13 - 14	13.5	1235	-604	365,378	0.06	0.58
8	14 - 15	14.5	1303	-537	287,966	0.06	0.64
9	15 - 16	15.5	1836	-3	12	0.08	0.72
10	16 - 17	16.5	2147	307	94,332	0.10	0.82
11	17 - 18	17.5	2070	231	53,276	0.09	0.91
12	18 - 19	18.5	1948	109	11,862	0.09	1.00
TOTAL			22072		2,263,821		
AVERAGE			1839				

TABLE 4: TRAFFIC CENSUS RESULT FOR THURSDAY, 20/09/2012

ith No.	Class Interval (Hrs)	Class mid point	No of Vehicles $X_i$	$(X_i - \bar{X}_1)$	$(X_i - \bar{X}_1)^2$	Probability $\frac{X_i}{\sum X_i}$	Cumulative Probability
1	7 - 8	7.5	958	-608	369,917	0.05	0.05
2	8 - 9	8.5	1357	-209	43,643	0.07	0.12
3	9 - 10	9.5	1822	255	65,174	0.10	0.22
4	10 - 11	10.5	2030	463	214,547	0.11	0.33
5	11 - 12	11.5	2063	496	246,206	0.11	0.44
6	12 - 13	12.5	1401	-165	27,195	0.07	0.51
7	13 - 14	13.5	1151	-416	172,813	0.06	0.57
8	14 - 15	14.5	1137	-429	183,962	0.06	0.63
9	15 - 16	15.5	1417	-150	22,353	0.08	0.71
10	16 - 17	16.5	1529	-37	1,392	0.08	0.79
11	17 - 18	17.5	1940	374	139,945	0.10	0.89
12	18 - 19	18.5	1991	425	180,363	0.11	1.00
TOTAL			18796		1,667,509		
AVERAGE			1566				

TABLE 5: TRAFFIC CENSUS RESULT FOR FRIDAY, 21/09/2012

ith No.	Class Interval (Hrs)	Class mid point	No of Vehicles		Probability $\frac{X_i}{\sum X_i}$	Cumulative Probability
			$X_i$	$(X_i - \bar{X})^2$		
1	7 - 8	7.5	2363	486	0.10	0.10
2	8 - 9	8.5	2934	1,058	0.13	0.24
3	9 - 10	9.5	2326	449	0.10	0.34
4	10 - 11	10.5	1795	-82	0.08	0.42
5	11 - 12	11.5	1536	-340	0.07	0.49
6	12 - 13	12.5	1379	-497	0.06	0.55
7	13 - 14	13.5	1368	-508	0.06	0.61
8	14 - 15	14.5	1629	-247	0.07	0.68
9	15 - 16	15.5	2108	232	0.09	0.77
10	16 - 17	16.5	1729	-148	0.08	0.85
11	17 - 18	17.5	1827	-49	0.08	0.93
12	18 - 19	18.5	1522	-354	0.07	1.00
TOTAL			22517		2,449,533	
AVERAGE			1876			

TABLE 6: TRAFFIC CENSUS RESULT FOR SATURDAY, 22/09/2012

ith No.	Class Interval (Hrs)	Class mid point	No of Vehicles		Probability $\frac{X_i}{\sum X_i}$	Cumulative Probability
			$X_i$	$(X_i - \bar{X})^2$		
1	7 - 8	7.5	710	-582	0.05	0.05
2	8 - 9	8.5	1066	-226	0.07	0.11
3	9 - 10	9.5	1339	47	0.09	0.20
4	10 - 11	10.5	1499	207	0.10	0.30
5	11 - 12	11.5	1568	276	0.10	0.40
6	12 - 13	12.5	1451	159	0.09	0.49
7	13 - 14	13.5	1314	22	0.08	0.58
8	14 - 15	14.5	1320	28	0.09	0.66
9	15 - 16	15.5	1302	10	0.08	0.75
10	16 - 17	16.5	1343	51	0.09	0.83
11	17 - 18	17.5	1347	55	0.09	0.92
12	18 - 19	18.5	1246	-47	0.08	1.00
TOTAL			15505		544,916	
AVERAGE			1292			

TABLE 7: TRAFFIC CENSUS RESULT FOR SUNDAY, 23/09/2012

ith No.	Class Interval (Hrs)	Class mid point	No of Vehicles $X_i$	$(X_i - \bar{X}_1)$	$(X_i - \bar{X}_1)^2$	Probability $\frac{X_i}{\sum X_i}$	Cumulative Probability
1	7 - 8	7.5	578	-276	76,248	0.06	0.06
2	8 - 9	8.5	763	-91	8,214	0.07	0.13
3	9 - 10	9.5	983	129	16,587	0.10	0.23
4	10 - 11	10.5	1015	162	26,131	0.10	0.33
5	11 - 12	11.5	887	33	1,115	0.09	0.41
6	12 - 13	12.5	831	-23	519	0.08	0.49
7	13 - 14	13.5	704	-150	22,497	0.07	0.56
8	14 - 15	14.5	706	-148	21,866	0.07	0.63
9	15 - 16	15.5	823	-31	978	0.08	0.71
10	16 - 17	16.5	916	62	3,845	0.09	0.80
11	17 - 18	17.5	1001	147	21,553	0.10	0.90
12	18 - 19	18.5	1040	186	34,607	0.10	1.00
TOTAL			10246		234,159		
AVERAGE			854				

Table 8. Values of Means, Variance and Standard Deviation

DAYS	MEAN	VARIANCE	STANDARD DEVIATION
Monday	2417.33	148204.37	384.97
Tuesday	2053.04	136622.98	369.63
Wednesday	1839.37	205801.87	453.65
Thursday	1566.31	151591.76	389.35
Friday	1876.38	222684.82	471.89
Saturday	1292.05	49537.78	222.57
Sunday	853.83	21287.21	145.90

TABLE 9. Correlation Coefficients relationship details

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Monday							
Tuesday	0.38						
Wednesday	0.63	0.68					
Thursday	-0.04	0.44	-0.08				
Friday	0.42	0.67	0.74	-0.20			
Saturday	-0.49	-0.18	-0.74	0.62	-0.61		
Sunday	0.06	0.44	-0.06	0.92	-0.21	0.62	

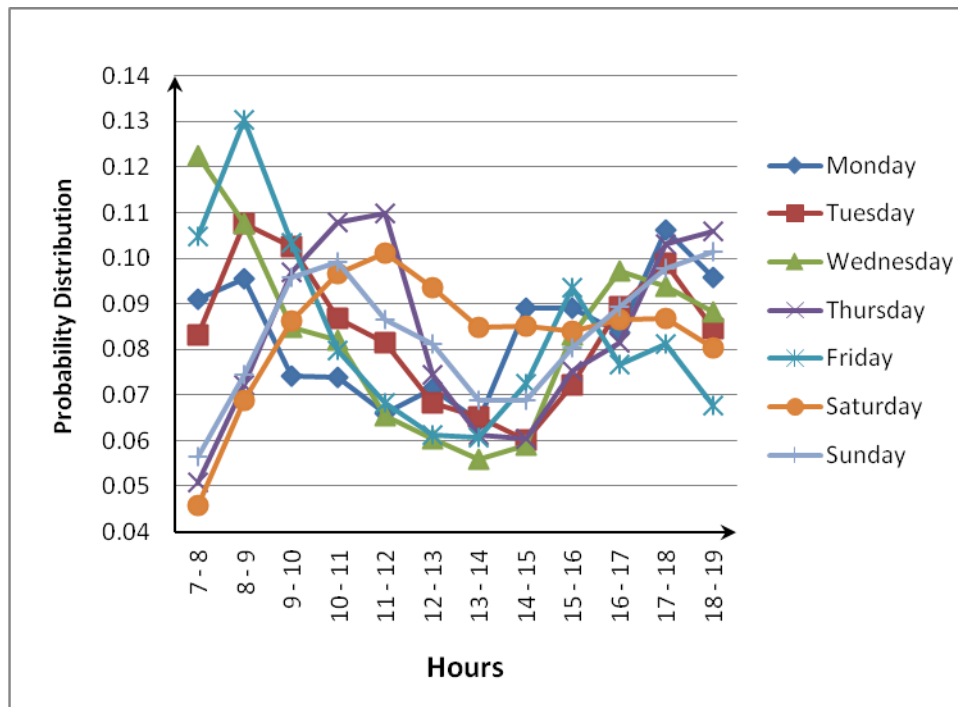


Fig. 1: Graph of Probability Distributions versus Hours

#### IV. DISCUSSION

A total of 29008, 24637, 22072, 18796, 22517, 15505 and 10246 were recorded for Monday, Tuesday, Wednesday, Thursday, Friday, Saturday and Sunday respectively. Also, average vehicles per hour for these days were found to be 2417, 2053, 1839, 1566, 1876, 1292 and 854 respectively.

The traffic pattern shows a general characteristic of high volume in the morning from 7.00am to 11.00am, thereafter, the traffic volume dropped during the mid-afternoon from 11.00am to 3.00pm. The traffic volume surged upward again in the evening from 3.00pm to 7.00pm.

It is also noted that unlike other working days, the traffic volume on Thursday is lower in volume and devoid of the early morning high volume which characterize other working days. Traffic during the weekend shows a reduction in traffic volume. Saturday traffic in addition to its lower volume has similar trend with Thursday traffic pattern. The traffic count also revealed that Sunday had the least traffic volume with value less than half of most of the working days.

The probability distributions against the hours within the period of traffic count for each day are as shown in Fig. 1. Simple correlations for the seven days are as shown in Table 9. The correlation coefficient values gave an indication that there are fairly strong correlation ranging from +0.57 to +0.74 for the following pair days: Mondays and Wednesday; Tuesday and Wednesday; Tuesday and Thursday; Tuesday and Friday; Wednesday and Friday; and Saturday and Sunday. Similarly, a weak positive correlation ranging from +0.18 to +0.38 existed between the following pair days: Monday and Tuesday; Monday and Thursday; Monday and Friday; Wednesday and Thursday; Thursday and Saturday; and Tuesday and Sunday. On the other hand, weak negative correlations ranging between -0.18 to -0.21 were found to exist between the following pair days; Tuesday and Saturday; and Friday and Sunday. A moderately high negative correlation existed between the pair days of Wednesday and Saturday; Friday and Saturday; and Monday and Saturday. The pair days of Monday and Sunday; Thursday and Friday; and Wednesday and Sunday show no correlation.

#### V. CONCLUSION

The vehicular traffic flow along the road was high on each working day with peak period in the mornings. This could be attributed to people going to work outside Ikorodu which is substantially residential area in nature. Another contributing factor to this could be people travelling out of Ikorodu. In the afternoon, people are still at work, hence, the reduction in traffic volume during this period. In the evening, the traffic volume increased again because the people have closed from work and are returning back.

It can be inferred that the high volume of vehicular traffic will result in air pollution in the form of noise and gaseous auto-combustion products such as hydrocarbons. The pollution is expected to increase and decrease proportionally with the pattern of traffic flow each day. The high traffic volume is evident from the regular traffic congestion usually experienced by motorists at the approaches of the two roundabouts along the route.

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