

Full Length Research Paper**Assessment of Railway Performance and Road Accidents Rate in Nigeria****Chukwurah, Gladys; Kanu, Ejikeme Johnson* and Ogboi Kingsly Chijioko***Department of Urban and Regional Planning, University of Nigeria, Enugu Campus, Nigeria.***Article history**

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Abstract

This study examines the relationship between railway performance and road accident rate in the country. The study utilizes secondary data; railway performance (number of passengers, freight carriages, passenger revenue and freight revenue) were obtained from Nigeria Railway Corporation while record on road accidents was obtained from Federal Road Safety Corp and Nigeria Police Force. The data were obtained for a period of 42 years from 1970-2012. Multiple Linear Regression Techniques was used for the analysis. The result shows $R = 0.760$, Adjusted R square = 0.565, P-Significant = 0.000. The result revealed significant relationship between railway performance and road accident rates in the country at $P < 0.05$. Base on this finding the author suggests revitalization, expansion and modernization of railway transportation for drastic reduction of the rate of road accidents in Nigeria.

Key words: Railway performance, Road Accidents Rate.

Introduction

Nigerian railway played a very active role in overland freight movement in the early years after 1960, and accounted for approximately one-third of freight traffic. It was also major mover of freight and passengers across the country, especially where the rail lines traversed (Robinson et al, 1961). But some years after, the Nigeria railway transportation began to witness accelerated systematic inefficiency. Railway transportation started to experience crises in the mid 1970s (Aderibigbe et al 2011). The operational performances of 6,755,000 and 1,612,000 tons for passengers and freight respectively in 1975 drastically dropped to 6,520,000 passengers and 202,000 tons in 1989. Also, the number of passengers declined from 14 million passengers in 1980, to a miserable 1 million in 2005, while freight traffic fell from 3 million tons in 1980 to less than 500,000 tons in 2005. Busy routes like the Lagos axis experienced reduction in train traffic in 2005, with passenger transport reducing to four departures weekly. Two of the four were moving to Kano, one to Jos and the other to Maiduguri. Port-Harcourt which used to be one of the busiest terminals also had its weekly departure schedule reduced to just four trains. According to Traffic Report (2001), the estimate for road traffic for passengers averaged 41.96 million per annum, 2.9 million by air, and 2.21 million by railway and about 1 million by water transportation. Regrettably, only 1.2% of the Nigerian population in 2010 patronized railway transportation. An estimated 90% of passengers and freight in Nigeria rely on the road network with the attendant challenge of increased number and incidences of road accident. In 1976, there were 53,997 road traffic accidents resulting in 7,717 deaths. In 1981 the magnitude reduced to 35,114 accidents but the deaths increased to 10,236, while in 1984 Nigeria was said to have the highest rate of road traffic deaths in Africa and indeed the world. In 1988 there were 25,292 road traffic accidents with as high as 9,077 deaths. The 1988 accident data reveals an embarrassing rate of 69 road accidents and 24 deaths every day of that year. According to the Federal Road Safety Commission (2006), between 1970 and 2001, Nigeria recorded a total of 726,383 road traffic accidents resulting in the death of 208,665 persons and 596,425 injuries. In that period, each succeeding year recorded more accidents, deaths and injuries. According to data from the Federal Road Safety Commission (2006), the country has the highest rate of death from road accidents in Africa; leading 43 other nations in the number of deaths per 10,000 vehicle crashes. Globally, road traffic accidents in terms of frequency of occurrence and fatality rate has changed but not reduced over the years in Nigeria compared to other developing countries. This study, therefore examine the relationship between railway performance and road accident rates in the country. The hypothesis postulated was that there is no significant relationship between railway performance and road accident rates in Nigeria. The study covered a time frame of 42 years (1970 – 2012).

Odeleye (2010) revealed that presently, railway transportation in Nigeria accounts for an insignificant part of the transport sub-sector and therefore contributes too tiny a proportion of value added in transportation. The road transport has virtually taken over the traffic previously conveyed by rail, with severe consequences for the state of the roads in the country and this has not been appreciably addressed at the level of policy. Nigeria Railway News Magazine (1998), reports that the poor performance of railway transportation has seriously affected the road transportation in the country. The railway transportation has lost its customers to the road transportation. This according to him has caused undue pressure to the road network resulting to high rates of road accidents and loss

of life. Aderibigbe and Adurokiya (2011) reports that railway transportation helps to reduce much reliance on articulated vehicles on roads that often lead to intra-city traffic problems and subsequently fatal accidents, carnage and deterioration of highways. Adejumo, (2006) emphasizes the urgent need for railway transportation in Nigeria. He observed that land transportation comprises mostly unregulated contraptions passing for trucks, cars, buses, and motorcycles, jam-packed on roads which the government acknowledges as barely motor able. He pointed out that the Nigeria railway transportation is comatose after some two decades of development and the effects are harrowing in cities and farm villages. As a result, the choice for goods and humans has narrowed to either the road or expensive air flights. In cities, everyone squeezes unto roads. Populations which a few intra-city train journeys would have ferried in 1-2 rush hours, comfortably and safely, spend several hours in daily traffic jams, increasing rate of accidents and loss of lives. It is however, so sad that in this age of global competitiveness where rail system is favourably competing with road transportation in most developed and developing countries, that railway transportation in Nigeria is highly under developed and inefficient.

Global statistics (2010) show that railway transportation account for the majority of inter-urban passenger transportation in most African countries such as Ivory Coast, Egypt, and South Africa, as well as in Asian countries like China, Japan and India with equally high human population. In Asia, Europe and America, trains occupy a critical position in passenger transportation and this has even been heightened with the advent of high speed passenger trains. It also indicates that freights have experienced remarkable growth due to its comparative advantage as regards conveying bulky and heavy goods over long distance. The safety in this process cannot be compared with movement of goods by road transportation where the activities of armed robbers and pirates can only be imagined. This is aside the frequent damages and loss of goods experienced during road accidents especially in Nigeria where most roads are in deplorable condition (Negedu 2011).

Railway and Road Network in Nigeria

The current imbalance in modal share between rail and road transportation emerged after the 1960s. The length of railway network stayed constant at 3505 route-km over the last 100 years. By comparison, in 1992, there were 32,180 km of all-weather federal roads not including state and rural roads (Odeleye2008). Further development of the railways was abandoned in favour of road transport by successive governments. Some highways were constructed parallel to railway lines, resulting in competition rather than a complementary role between road and rail transport. The difference in allocation of funds for railway and road transport by the government still haunts railway development. Roads were expanded without any consideration of the attendant effects such as road traffic accidents, Up until then, the railways carried over 60 per cent of the freight tonnage compared to its current share of less than 2 per cent (Adesanya, 2010). The poor performance of railway transport service has made the NRC to lose the patronage to road transportation. The road transport sub sector has continued to grow much more than other transport sub sectors in terms of motor vehicles in operation size of road network and not less than 90% of Nigerian mobility needs in terms of movement of goods and services are satisfied through the road mode at the expense of the potential contribution to rail modes.

The over reliance on the road system constitute the creation of unnecessary pressure on the highway in the country which resulted in regular occurrence of accidents, a situation that has been made worse by their deteriorating condition (Gbadamosi, 2005). Nigeria has been consistently ranked as having the highest incidents of road traffic accidents in the world for obvious reasons in addition to known causes of accidents across the globe which includes very bad road arising from poor maintenance culture and poor road.

Materials and methods

Study Area

Nigeria lies within latitudes 4⁰1' and 13⁰9'N and longitudes 2⁰2' and 14⁰30'E. It is bordered in the northwest and north by the Republic of Niger, in the East by the Republic of Chad and Cameroon and in the West by the Republic of Benin. About 800 km of the Atlantic Ocean coastline forms the southern border which stretches from the Badagry inlet in the West to the Rio del Rey, east of the Cross River estuary. The evolution of the modern transport system in Nigeria began during the colonial period. The networks of rail, water and road that were developed then were built for the exportation of cash crops and the importation of mass produced consumption goods. They were planned in the most economical way possible and later proved inadequate.

Sampling design

The study adopted the survey design. The study was conducted in four geo-political zones of Nigeria, namely South-West, South East, North West and North East. Using purposive sampling and simple random sampling techniques 1600 copies of questionnaires were distributed in the railway communities (railway sub-stations) in the geo-political zones. The odd – even product moment correlation statistics was used to test the reliability of the instrument. The co-efficient index was calculated and the score obtained was 0.88.

Sample size

The sample size of the population for each state was determined using Taro Yamani formula.

$$X = \frac{N}{1 + Ne^2}$$

Where X = sample size

N = population of the study

e² = level of significance or error factor which is

$$a = 0.05^2$$

Applying the above formula, a total of 1600 was gotten. Since the data required from this source is to corroborate the secondary data as well as get manageable population size, 1600 respondents were used in the study as the sample size. Sample size of 400 respondents was chosen for each of Lagos, Enugu, Minna and Kafanchan. Data on the number of passengers and freight carried, total revenue generated from number of (passenger/freight carried) and data on road accident were used for the analysis. Data were collected from NRC Annual Reports, FRSC and Nigeria Police Force respectively. The data covered a period of 42 years (1970 – 2012). The analysis was carried out using the Statistical Package for Social Sciences (SPSS). Multiple Linear Regression statistical Analysis was used in testing the hypothesis. In this study, the null hypothesis is to determine whether significant relationship exists between railway performance and road accident rate in Nigeria. The equations of the

Multiple Linear Regression statistical technique $Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_nX_n + e$

Y (total number of accidents) = $a + b_1$ passenger carriage + b_2 revenue from passenger carriage + b_3 freight carriage + b_4 revenue from freight carriage + b_5 total revenue generated from passenger and freight carriages.

a = Regression constant

b_1, b_n = Coefficients of independent variables

X_1, X_n = Independent variables (passenger carriage, b_2 revenue from passenger carriage, freight carriage, revenue from freight carriage, total revenue generated from passenger and freight carriages.

e = Residual error term

R^2 = the coefficient of relationship is defined as measure of variation explained by the regression.

Data Presentation and Analysis

The hypothesis states that there is no significant relationship between railway performance and road accident rates in Nigeria. The hypothesis was tested with Multiple Linear Regression Statistical Analysis. The result of the hypothesis suggests that there is a significant relationship between railway performance and rate of road accidents in Nigeria. $R = 0.760$, Adjusted R square = 0.565, P-Significant = 0.000. Since the test is significant at $P < 0.05$, the null hypothesis is therefore rejected. The result of the test shows that there is a significant relationship between railway performance and rate of road accidents in Nigeria. The variables of railway performance are summarized as identified performance output which includes: passengers' carriage, passengers' revenue, freight carriage, and freight revenue; while the rate of road accidents is measured by total number of road accidents per annum from 1970-2012. These performance factors were identified to have significant relationship with the rate of road accident in the country. The result also shows the extent of influence these performance factors have on road accident rates which includes: p-correlation = -.120, -.007, -.209, and .034 respectively. Railway performance explains for 56.0% of the rate of road accidents in Nigeria. However, about 44.0% were unexplained by the four identified determinants.

Results

The result of hypothesis suggests that there is significant relationship between railway performance and rate of road accidents in Nigeria. The variables of railway performance are summarized as identified performance output which includes: passengers' carriage, freight carriage, passenger revenue, and freight revenue. These factors were identified to have significant relationship with the rate of road accident in the country. The result also shows the extent of influence these factors have on road accident rates. These determinants account for 57.5% influence on road accident rates in the country. This study is inconsistent and an improvement of the previous researches done by Adejumo(2006), Odeleye (2010), Aderibigbe and Adurokiya (2011), Nigeria Railway News (1998), pointed out that the poor performance of railway transportation has seriously affected the road transportation in the country and this has resulted to increasing rate of accidents and loss of lives.

Table 1. Operational Performance of NRC from 1970-2012.

Year	Managerial era	Passenger carried	Revenue #	Freight carried	Revenue #	Total Revenue Pass+Freight
1970	P	8,942,000	4,676,000	1,311,000	18,438,000	23,114,000
1971	P	6,151,000	6,296,000	1,311,000	15,680,000	21,976,000
1972	P	5,819,000	7,477,000	1,519,000	17,095,000	24,542,000
1973	P	5,131,000	6,906,000	2,129,000	18,025,000	24,931,000
1974	P	4,324,000	6,067,000	1,098,000	12,205,000	18,272,000
1975	P	6,755,000	11,003,000	1,612,000	14,724,000	25,727,000
1976	P	7,491,000	10,004,000	1,452,000	16,232,000	26,726,000
1977	P	6,747,000	10,822,000	2,375,000	16,772,000	27,994,000
1978	P	6,750,000	12,982,000	1,592,000	17,172,000	29,233,000
1979	Pp	6,771,000	18,716,000	2,543,000	16,251,000	40,577,000
1980	Pp	4,917,000	17,290,000	1,153,000	21,861,000	40,603,000
1981	Pp	9,638,000	26,623,000	1,932,000	23,313,000	71,713,000

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1982	Pp	1,1612,000	28,288,000	2,185,000	45,090,000	77,309,000	
1983	P	13,142,000	29,877,000	1,619,000	36,499,000	66,376,000	
1984	P	15,553,000	33,147,000	1,458,000	33,335,000	66,482,000	
1985	P	11,324,000	36,205,000	1,182,000	34,247,000	70,452,000	
1986	P	9,878,000	39,059,000	852,000	26,335,000	65,394,000	
1987	P	7,383,000	35,750,000	353,000	15,632,000	51,382,000	
1988	P	4,196,000	25,117,000	326,000	13,206,000	38,323,000	
1989	Pp	6,520,000	24,318,000	202,000	18,155,000	42,473,000	
1990	Pp	6,345,000	31,403,000	198,000	35,911,000	67,314,000	
1991	Pp	3,443,000	19,300,000	237,000	64,400,000	83,700,000	
1992	Pp	1,747,000	17,013,000	204,000	49,732,000	66,745,000	
1993	P	1,502,000	14,627,000	106,000	25,841,000	40,468,000	
1994	P	784,491	36,809,000	106,000	121,911,902	158,712,786	
1995	Pp	2,889,977	56,144,354	107,000	133,911,902	190,026,624	
1996	Pp	2,626,026	112,907,824	137,000	161,348,796	274,256,624	
1997	Pp	2,946,940	126,456,928	535,000	219,175,125	435,632,053	
1998	Pp	1,070,424	74,457,194	1,513,077	438,779,607	513,236,801	
1999	Pp	1,788,171	88,882,085	737,239	404,436,982	493,229,067	
2000	P	2,610,435	142,920,540	116,837	155,865,908	298,786,448	
2001	P	1,284,022	110,456,518	132,813	165,256,201	275,712,719	
2002	P	942,594	62,977,167	98,192	132,907,397	195,884,564	
2003	P	1,608,447	103,858,378	56,178	101,088,080	206,606,083	
2004	P	1,751,000	206,772,909	62,575	112,480,539	319,253,448	
2005	P	752	87,178	84	110,011	197,189	
2006	P	708	84,322	41	108,948	157,270	
2007	P	1,478	145,100	36	82,811	227,911	
2008	P	1,996	233,513	47	78,600	312,113	
2009	P	1,285	204,573	52	60,711	265,284	
2010	P	1,514	205,241	138	81,822	287,063	
2011	P	3,140,722	n.a	181,8600	n.a	684,8000	
2012	P	4,155,988	n.a	182,465	n.a	n.a	

Source: Nigeria Railway Corporation Annual Reports (1970-2012).

n.a= Not available

Table: 2. Road Accident Statistics in Nigeria 1970-2012

S/N	Year	Fatal	Serious	Minor	Total Cases	No Killed	No Injured	Total Casualty
1	1970	1999	6666	7991	16656	2893	13154	16047
2	1971	129	8098	8518	16745	3206	14592	17798
3	1972	2782	9275	11100	23187	1972	2782	9275
4	1973	2981	9275	11925	2418	4537	18154	22691
5	1974	3467	11557	13869	2889	4992	18660	23652
6	1975	2834	9446	11331	23611	5552	20132	25684
7	1976	905	17352	19624	37881	6761	28155	34916
8	1977	4242	14140	17334	3571	8000	30023	38023
9	1978	4333	14444	17334	36111	9252	28854	38106
10	1979	3513	11708	14050	29271	8022	21203	29225
11	1980	1856	14855	15427	32138	8736	25484	34220
12	1981	4053	13510	16214	33777	10202	26337	36539

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13	1982	4451	14838	17805	37094	11382	28539	39921	
14	1983	3853	12844	15412	32109	10462	26866	37328	
15	1984	4467	10557	13868	28892	8830	23861	32691	
16	1985	3597	11991	14380	29968	9221	23853	33074	
17	1986	3022	10075	12091	25188	8154	22176	30330	
18	1987	3385	11286	13544	28215	7912	22747	30659	
19	1988	607	885	680	2172	9077	24413	33490	
20	1989	n.a	n.a	n.a	n.a	n.a	n.a	n.a	
21	1990	6140	8796	6998	21934	8154	22786	30940	
22	1991	6719	8982	6845	22546	9525	24508	34033	
23	1992	6986	9324	6554	22864	9620	5759	15379	
24	1993	6735	8443	6281	21459	9454	24146	33600	
25	1994	5407	7522	5275	18204	7440	17938	25378	
26	1995	4701	7276	5053	17030	6647	14561	21208	
27	1996	4790	6964	4688	16442	6364	15290	21654	
28	1998	4757	7081	4300	16138	6538	17341	23879	
29	1999	4621	688	4359	15868	6795	17728	24523	
30	2000	5287	6820	4499	16606	8473	20677	29150	
31	2001	6966	8185	5379	20530	9946	23246	33195	
32	2002	4029	7190	3325	14544	7407	22112	29519	
33	2003	3910	7882	2572	14364	6452	18116	24568	
34	2004	3275	6948	4051	14274	5351	16897	22248	
35	2005	2299	4143	2620	9062	4519	15779	20298	
36	2006	2600	5550	964	9114	4944	17390	22334	
37	2007	2162	4812	1503	8477	4673	11794	16467	
38	2008	3024	5671	2646	11341	6661	27980	34641	
39	2009	2460	6024	2370	10854	5693	27270	32963	
40	2010	1178	2819	1333	5330	4065	18095	22160	
41	2011	1764	2485	516	4765	4327	17464	21791	
42	2012	1953	3106	1210	6269	4260	20757	25017	

Source: Computed from data from Nigeria Police Force and FRSC, Abuja.

Note: n.a= not available

Table 3: Multiple linear regression result

Excluded Variables ^b								
Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics		
						Tolerance	VIF	Minimum Tolerance
1	no of frieght	-.175 ^a	-1.262	.215	-.209	.604	1.656	.604
	Revenue	-.005 ^a	-.042	.967	-.007	.925	1.082	.925
	passenger revenue	-.079 ^a	-.713	.480	-.120	.965	1.037	.965
	frieght revenue	.023 ^a	.202	.841	.034	.913	1.096	.913

a. Predictors in the Model: (Constant), no of passengers

b. Dependent Variable: VAR00010

Table 4: Model Summary^b

Mode	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.760 ^a	.577	.565	6,443.436	.577	49.127	1	36	.000	.964

a. Predictors: (Constant), no of passengers

b. Dependent Variable: VAR00010

Table 5: ANOVA^b

Model	Sum of	Df	Mean Square	F	Sig.
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Squares						
1	Regression	2.040E9	1	2.040E9	49.127	.000 ^a
	Residual	1.495E9	36	4.152E7		
	Total	3.534E9	37			

a. Predictors: (Constant), no of passengers

b. Dependent Variable: VAR00010

Table 6: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics		
		B	Std. Error				Lower Bound	Upper Bound	Zero-order	Partial	Partial	Tolerance	VIF	
1	(Constant)	12484.196	1595.439		7.825	.000	9248.496	15719.897						
	no of passengers	.002	.000	.760	7.009	.000	.001	.002	.760	.760	.760	1.000	1.000	

a. Dependent Variable: VAR00010

Table 7: Collinearity Diagnostics^a

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions	
				(Constant)	no of passengers
1	1	1.755	1.000	.12	.12
	2	.245	2.679	.88	.88

a. Dependent Variable: VAR00010

Conclusion

It was revealed that there is a significant relationship between railway performance and road accident rate in the country. The poor performance of railway transportation in the country has led to high dependence on motorized transportation. Passengers and freight carriages have shifted to road transportation. One major implication of this is high accident rates on the roads. This study therefore suggests revitalization and modernization and expansion of railway transportation as an alternative mode of transportation. This will decongest the road transport and drastically reduce road accident rates in Nigeria.

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