QUALITY OF ROAD TRANSPORT INFRASTRUCTURE IN MINNA METROPOLIS, NIGERIA

By

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ABSTRACT

Road transport infrastructure enhances both the economic growth and the social cohesion of a country, to the extent that a region cannot be economically competitive without an effective road transport network. This study assessed the quality of road transport infrastructure in Minna metropolis, seventeen arterial and collector roads were purposively selected based their design and traffic carrying capacity. Field observatory survey and interview methods were used to acquire data on the availability and condition of road and complimentary infrastructures like: shoulder, traffic lights, streetlights, pedestrian facilities-walkways, crossings, road islands and overhead bridges. The data were analyzed using frequency tables, charts and plates. The result shows that while Minna metropolis has basic road and complimentary infrastructures, the condition of the roadway shoulder, traffic lights and drainages are in poor state of functionality. Furthermore, inadequate funding was recognized as the major challenge preventing the Niger State Road Maintenance Agency (NIGROMA) from maintaining the road infrastructure on a sustainable basis. The study recommended among other things better funding of NIGROMA in order to continuously respond to the mending of all cracks and potholes, regular and routine maintenance of street lights and traffic lights, clearing of road drainages and culverts, repainting of all pedestrian crossings and a renewed awareness to the pedestrians about the benefits of using the pedestrian facilities as well as the dangers of neglecting them. This will improve safety in mobility by road and by implication alleviating poverty among the residents of Minna metropolis.

Key words: Complimentary facilities, Infrastructure, Road, Transportation

INTRODUCTION

The road transport infrastructure in Nigeria is perceived to have been in a very bad condition for a long time despite several reforms and improvement measures by all tiers of government (Ademola, 2013). The transport sector and the road subsector in particular is a key to many aspects of economic life, while the road transport infrastructure enhances both the economic growth and the social cohesion of a country, such that a region cannot be competitive without an effective transport network (Vita, 2008; Persson and Song, 2010). Effective road transportation must of necessity include the provision of quality infrastructures and complimentary facilities

which in turn supports the delivery of goods and services in a secure and timely manner, while also linking workers to the suitable jobs (Okezie, 2013).

A road could be an identifiable route, path or way, smoothed, paved, or designed for ease of movement between two or more places, the road is the major mode of transportation in Nigeria with patronage cutting across individual commuters, private, corporate and government organizations. The constricting nature of the water ways, coupled with the near collapse of the rail systemand the high cost of air travels have further exerted a lot of pressure on the road, as over 75 percent of the total movements in the country are made by road (Ademola, 2013). According to Filani (2002), only 50% and 20% of Federal and State roads respectively are in good condition, while only 5% of the rural roads are freely motor-able despite several reforms in the transport sector. In the 2010-2011 Competitiveness Report, Nigeria received poor assessment for its infrastructure, with the country scoring 135th out of the 139 countries covered. The forum noted that 65% of about 198,000 km of roads in Nigeria were in bad condition (The Global Competitiveness Report, 2011).

Furthermore, out of about 198,000km of roads in Nigeria, less than 39,600km (20%) are paved and more than 128,700 (65%) are in terrible condition compared to South Africa's 362,099 km of roads out of which 73,506 km are paved and the rest in good motorable condition (Ohia, 2011). Richardson and Jensen (2000), noted that one method of reducing spatial differences is to efficiently provide and improve transport infrastructures which in turn improve accessibility. For a country's economy to improve, it must strive to improve the efficiency and effectiveness of its transport system.

Nigeria is increasingly dependent on the road transport system to cater for her inland transport needs. This dependence has led to three major problems, which includes: overloading, neglect of routine maintenance and inadequate design, construction and provision of road infrastructures. The continuous reliance on road transport system for movement of people and goods in Nigeria increases the urgency of tackling the issue of poor road infrastructure in the country. This is because roads, bridges and other complimentary facilities need to be kept in good condition in order to acquire the desired socio-economic growth of the country (Draft National Transport Policy for Nigeria, 2010).

Minna the capital of Niger State has an estimated population of 304,113 (NPC 2009). With the growing population, increasing number of industries and interstate vehicular traffic, the existing roads may not be able to meet the current demand for the movement of goods and people. The increasing deterioration of the road surface and shoulder condition, the continuous breakdown of other road facilities has raised several questions like: how functional are the types of road transport infrastructure in Minna, and what are the challenges to its sustainable maintenance? These will form the focus of this study.

THE STUDY AREA

Minna, the capital of Niger state lies between Latitudes 9° 38´ - 9° 45´ North and Longitude 6° 33´ - 6° 39´ East, is connected to Kaduna and Ilorin by road and rail. The city is about 150 km away from the country's capital city Abuja. The metropolis has a mean annual rainfall of 1334mm; the highest mean monthly rainfall is September with almost 30mm. the rainy season starts in April and last till October, the duration of the rainy season is between 190-200 days. The mean monthly temperature is highest during the peak of the dry season usually between February and March at 37.8^{0}C (NIMET, 2010)**.**

The land mass of Minna covers 885 hectares with commercial, residential, agricultural, institutional, industrial and recreational land uses. The residential land use which is the largest accounts for about 55% (486 hectares of land) of the total hectares of land in Minna (Mohammed, 2014). The commercial land use is found within the Minna Central Business District located at the core areas of Minna. Other commercial activities include markets, petrol stations and parks found in this area. The Institutional Land Use in Minna include the government offices, general hospital, courts, military cantonment, postal offices, police establishments and Educational institutions (which are nursery, primary, secondary and tertiary institutions). These can be found at both the central and peripheral parts of Metropolis. The Industrial Land Use housing various industries like sachet and bottle water production, agro-allied industries etc are located at the Sauka Kahuta area. Figure 1 shows the road network in Minna metropolis.

Fig. 1 Road Network of Minna Metropolis
Source: Department of Urban & Regional Planning, FUT, Minna

MATERIALS AND METHODS

The study is a field survey research type, data were collected on seven (7) arterial and ten (10) collector roads as listed in Table 1 and further illustrated with Figure 1. The arterial roads studied include the Bosso road, Bida road, Western by-pass, Eastern by-pass, Gwada, Paiko and Maitumbi roads. The selection of these arterial and collector roads were based on the vehicular and pedestrian traffic they carry as well as serving as the gateway to the metropolis where vehicular traffic enter and exit. The types of data collected were: road surface, shoulder and drainage conditions, traffic and streetlights functionality, pedestrian walkways and pedestrian islands conditions. The instruments that were used include physical observations, counting and measurements, the data were sourced from the roads, users of the roads and government officials in charge of road maintenance in the State.

The procedure for data collection began with reconnaissance survey of the selected arterial and collector roads, development of survey instruments form for auditing, counting and measurement of road length, surface condition, potholes and cracks assessment as well as road complimentary facilities functionality. The condition of the roads was assessed based on five scales: very good, good, fair, bad and very bad level based on the number and sizes of potholes and cracks notice on the surface during the survey. The length of each road relative to the total length was used to determine the overall condition of the arterial and collector roads in the metropolis. The interview with the officials of the Niger State Ministry of Works and Transport were used to determine the challenges to sustainable road infrastructure development and maintenance in the metropolis. The data was analyzed using descriptive tools like table of frequency, percentages, charts, maps and plates.

RESULTS AND DISCUSSION

Arterial Roads Characteristics and Condition

Figure 1 shows the sampled road and infrastructure studied, while Table 1, illustrated the existing road infrastructure in Minna and their condition. The characteristics of the roads: surface type, condition and an inventory of complimentary facilities.

Table 1: Arterial Road Characteristics and Inventory of Infrastructure in Minna

S/N	Road Name	Length (in km)	No of Lanes	Carriage	Surface Type	Road Surface Condition	Other Facilities Present
1	Bosso Road (Mobil-Maikunkele)	12.45	Dual	Dual	Asphalt	Poor	Pedestrian island, Traffic lights, Street lights, pedestrian Walkways, Drainage system, Roundabouts, Pedestrian Overhead Bridges
2	Bida Road	15.77	Single	Dual	Asphalt	Very Poor	Drainage System, Interchange, road shoulders
3	Western Bypass	13.42	Dual	Dual	Asphalt	Fair	Pedestrian walkway, streetlights, traffic lights, road interchange points, road shoulders
4	Eastern Bypass	6.45	Dual	Single	Asphalt	Fair	Pedestrian Walkways, Street lights, Pedestrian Walkways,
5	Gwada Road	11.47	Single	Dual	Asphalt	Fair	None
6	Paiko Road	16.6	Dual	Dual	Asphalt	Poor	Traffic lights, Street lights, roundabouts, Pedestrian Walkways, Drainage system, Pedestrian Island, Pedestrian Overhead Bridges.
7	Maitumbi-Mobil Road	4.50km	Dual	Single	Asphalt	Good	Road median, Street Lights, Drainage System, Pedestrian Walkway.

Source: Field survey (2017)

The total length of the arterial roads is about 80.66 km. The surface condition is observed to be good along Maitumbi Junction, fair along Eastern by-pass and Gwada junction and very poor along Bida road. The Bida road rated to be very poor has numerous large, deep potholes and alligator cracks. The basis of this classification is on the number and size of potholes and cracks noticed along the roads, Paiko road surfacing is poor because it has lots of small sized potholes and cracks, while Eastern bypass and Gwada road had few small-sized potholes and alligator cracks. The Maitumbi road is free from potholes and cracks as at the time of the study hence the good ratings. The length of each of arterial road as a proportion of the whole was computed in order to determine the percentage of the arterial road with good surfacing and the outcome is presented as Figure 2. Deriving from this, 72% of the arterial road network in Minna metropolis

has no good surfacing, while only 28% have good surfacing. Plate I shows some alligator cracks along Bosso Road- Minna.

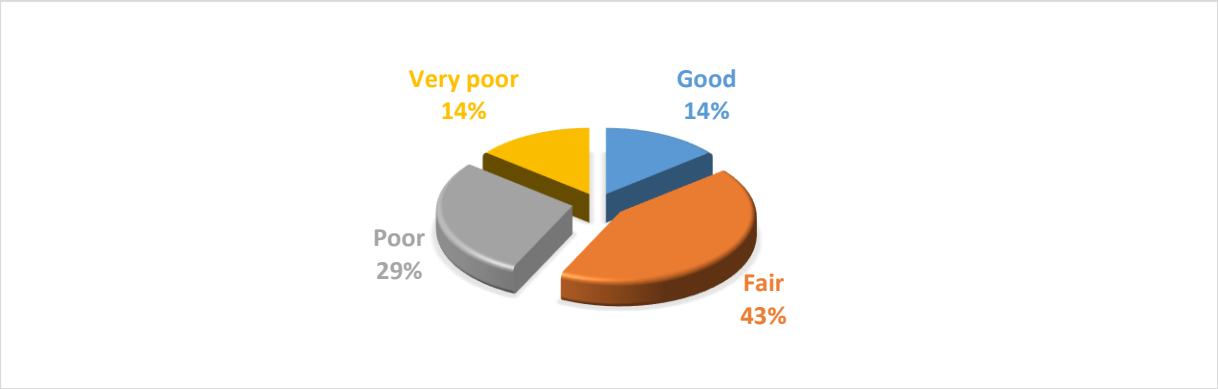

Fig. 2 Arterial Road Surfacing Condition

Plate I Alligator cracks along Bosso Road

Surface Condition of Collector Roads

The total length of the ten (10) collector roads is about 16.091km. As observed in Table 2, all except Kuta, Yakubu Lami and Old Airport Roads were dual carriage ways with Asphaltic overlay, they have good surfacing and laced with all kinds of complimentary facilities like: drainages, street lights, Pedestrian Island and Pedestrian walkways. As mentioned earlier the basis for the rating was the number and size of potholes and cracks noticed on the road surface during field survey.

Table 2: Characteristics and Condition of Collector Roads

S/N	Roads	Length (in km)	Lanes	Carriage	Surface Type	Surface condition	Other Infrastructures
1.	Kuta Road	0.77	Dual	Single	Asphalt	Good	Streetlights, Pedestrian Island, Pedestrian walkways, Drainage system
2	Stadium Road	1.10	Single	Dual	Asphalt	Fair	Streetlights, A Traffic light, Pedestrian Walkway, Drainage
3	Old Airport Road	0.90	Dual	Single	Asphalt	Good	Drainage, Traffic Lights Street Lights, Pedestrian Walkways, Pedestrian Island
4	Mypa Road	0.51	Single	Dual	Asphalt	Very Poor	None
5	Murtala Nyako Road	2.37	Single	Dual	Asphalt	Poor	Streetlights, road shoulder,
6	Bahago Drive	3.38	Dual	Dual	Asphalt	Good	Road shoulder, drainage system, pedestrian walkways, pedestrian Island
7	Yakubu Lami road	2.43	Dual	Single	Asphalt	Good	Road shoulder, drainage, Pedestrian walkways, Pedestrian island
8	Muazu Babangida road	2.86	Dual	Dual	Asphalt	Good	Road Median, Road Shoulder, Street lights, Pedestrian walkways
9	Shehu Musa road (Kpakungu road)	0.77	Dual	Dual	Asphalt	Good	Road Median, Road Shoulder, Streetlights, Pedestrian walkways
10	Kateren Gwari	1.46	Dual	Dual	Asphalt	Good	Road median, streetlights, drainage system, pedestrian walkway

Source: Authors' Fieldwork (2017)

Table 3 show a high percentage (70%) of the collector roads studied are in good condition, while 10% each were in fair, poor and very poor condition.

Table 3 Surface Condition of Collector Roads

Grade	Number of Roads	Percent
Good	7	70
Fair	1	10
Poor	1	10
Very poor	1	10
Total	**10**	**100**

Source: Authors' Fieldwork (2017)

ASSESSMENT OF ROAD COMPLIMENTARY FACILITIES

Some of the road complimentary facilities noted during data collection include; the Traffic lights, Streetlights, Pedestrian overhead bridges, road median, drainages and signage. These were evaluated on the basis of their functionality in all the arterial and collector roads studied.

The Road Shoulder

The road shoulder is a service lane of about 1.5 metres on both sides of the road where vehicle can clear into for the purpose of parking, boarding or alighting of passengers or loading and unloading of goods. Its presence and condition will not only improve the traffic carrying capacity of the road, but also reduce congestion and traffic interruption by other vehicles. Table 4 shows the condition of road shoulder along the arterial and collector roads in Minna metropolis.

Table 4: Road Shoulder Condition along Arterial and Collector Roads of Minna

S/N	Roads	Shoulder Condition					
		Very Good	Good	Fair	Bad	Very bad	Not Present
1.	Bosso road				✓		
2.	Bida road					✓	
3.	Western bye pass				✓		
4.	Eastern bye pass			✓			
5.	Gwada road		✓				
6.	Paiko road			✓			
7.	Maitumbi road		✓				
8.	Keteren Gwari	✓					
9.	Kuta road	✓					
10.	Stadium road				✓		
11.	Old Airport Road		✓				
12.	Mypa road						✓
13.	Murtala Nyako road				✓		
14.	Bahago Drive Road	✓					
15.	Yakubu Lami Road		✓				
16.	Muazu Babangida Road	✓					
17.	Kpakungu road	✓					

Source: Authors' Field Survey (2017)

As observed the road shoulder in the study area is in a very good condition along Keteren Gwari, Kuta, Bahago Drive, Muazu Babangida and Kpakungu Roads. This is due largely to the recent rehabilitation work carried out on these roads which have improved the facilities. Road shoulder is in good condition along Old Airport and Yakubu Lami roads, while it is in a very bad along Bida road and completely not available along Murtala Nyako road.

Table 5: Road Shoulder Condition in Minna Metropolis

Condition	**Number of Roads**	**Percentage present/not present**	**Percentage Present**
Very Good	5	-	31.2
Good	4	-	25.0
Fair	2	-	12.5
Bad	4	-	25.0
Very Bad	1	-	6.2
Total Present	16	94.1	100.0
Not Present	1	5.9	
Total	17	100.0	

Source: Authors' Field Survey (2017)

The generalized condition of road shoulder in the study area is presented in Table 5. It shows that 94.1% of the roads had road shoulders, while all other (5.9%) had no road shoulder. About 31% of the roads are in very good condition, meaning that they have surfacing without cracks or potholes. The edges are smooth and wider enough to accommodate any vehicle that wants to park from the main road. One-quarter is in good condition, i.e. the road shoulder surface has few cracks and/or small sized potholes, while 12.5% are in fair condition. The implication of this result is that about half of the road shoulders in Minna metropolis are in good condition. Plate II shows the condition of road shoulders along Bosso road, Minna.

Plate II: Condition of Road Shoulder on the Bosso Road

Pedestrian Walkways and Road Drainage System in Minna

The pedestrian walkway is a separated lane designed in between or beside the vehicle lanes to enhance the safety of the pedestrian as they walk along the roads, while the drainages are in the form of open or closed culverts and bridges designed to convey rain water from the road surfaces. Its availability and functionality can enhance the life span of the roads. Table 6 present the condition of this facilities in the study area.

Table 6 Pedestrian Walkways and Road Drainage System

Roads studied	Pedestrian Walkways				Drainage system			
	Good	Bad	Fair	Not available	Good	Bad	Fair	Not available
Bosso road			✓			✓		
Bida road				✓		✓		
Western bye pass			✓			✓		
Eastern bye pass		✓				✓		
Gwada road				✓				✓
Paiko road	✓						✓	
Maitumbi road	✓						✓	
Keteren Gwari	✓					✓		
Kuta road	✓					✓		
Stadium road		✓				✓		
Old Airport Road	✓					✓		
Mypa road				✓				✓
Murtala Nyako road				✓				✓
Bahago Drive	✓					✓		
Yakubu Lami Road	✓						✓	
Muazu Babangida road	✓						✓	
Kpakungu road	✓						✓	

Source: Authors' Field Survey (2017)

Paiko, Maitumbi, Keteren Gwari, Muazu Babangida and Kpakungu roads have very good pedestrian walkways, while its condition along Bosso Road and Western By-pass is not too good. However, it is completely absent along Bida road. It is noticed that drainage facilities is not very good in all the arterial and collector roads of the metropolis, however little improvement can be found along Kuta, stadium, Keteren Gwari roads. This facility is completely absent along Mypa, Kuta and Murtala Nyako Roads.The generalized availability and condition of pedestrian walkways in Minna roads is presented in Table 7.

Table 7: Generalized Availability and Condition of Pedestrian Walkways in the Metropolis

Grade	Number of Roads	Pedestrian Lane Availability	Percent
Good	8	-	66.7
Fair	2	-	16.7
Bad	2	-	16.7
Total	12	70.6	100.0
Not Present	5	29.4	
Total	17	100.0	

Source: Authors' Field Survey (2017)

From Table 7, 70.6% of the roads have pedestrian walkways, while 29.4% do not have pedestrian walkways while 66.7% of the roads with pedestrian walkways are in good condition while 16.7% are in fair condition and 16.7% in bad condition. Plate III shows the condition of pedestrian walkways along Airport Road.

Plate III: Pedestrian Walkway along Old Airport Road

Table 8 Generalized Condition of Road Drainage System

Drainage Conditions	**Number of Roads**	**Availability Percentage**	**Condition Percentage**
Bad	9	-	64.3
Fair	5	-	35.7
Total Present	14	82.4	100
Not Present	3	17.6	
Total	**17**	**100**	

Source: Authors' Field survey (2017)

From Table 8, 64.3% of the drainages in the metropolis were in bad condition, with the drains filled with sands, refuses and rubbles (as shown in Plate IV) which do not allow the flow of water, while 17.6% of the roads have no drainage. 35.7% of the roads with drainages were in fair condition, these drainages though still allowing the flow of water, it also had some refuse and needed clearance to prevent it from getting blocked.

Plate IV Blocked Drainage along Stadium Road

Traffic Lights

Information regarding the availability and condition of traffic lights on Minna roads is presented in Table 9. There are a total of twelve (12) traffic lights in the metropolis, ten (10) on the arterial roads, of which only six (6) are functional and two (2) on the collector roads and both were functioning. As attested to by the residents around the area during the survey, the damaged traffic light which shows red light all the time (Plate V) have remained in such condition for weeks.

There are two main types of streetlights used in Minna metropolis, they are the solar powered streetlights and the electric powered streetlights (Plate VI). As observed in Table 10, all the streetlights in Minna are functional, while only few damaged ones are currently being repaired as at the time of the survey. The streetlights are spaced at a distance of 20-25 meters from one another.

Table 9: Traffic Lights Availability and Condition

S/N	Roads	Traffic lights		
		Quantity	Functional	Not Functional
1	Bosso	6	2	4
2	Bida	-	-	-
3	Western Bye pass	2	2	-
4	Eastern Bye pass	-	-	-
5	Gwada	-	-	-
6	Paiko	2	2	-
7	Maitumbi – Mobil	-	-	-
8	Keteren Gwari	-	-	-
9	Kuta	-	-	-
10	Stadium	1	1	-
11	Old Airport	-	-	-
12	Mypa road	-	-	-
13	Murtala Nyako road	-	-	-
14	Bahago Drive	-	-	-
15	Yakubu Lami Road	1	1	-
16	Muazu Babangida	-	-	-
17	Kpakungu road	-	-	-
Total		**12**	**8**	**4**

Source: Authors' Field survey (2017)

Plate V Damaged Traffic Light along Bosso Road

Plate VI Electricity Powered Street Light along Old Airport Road

Table 10 Street Lights availability and Condition

S/N	Roads	Streetlight Availability		Functionality	
		Present	Not Present	Mostly functional	Mostly not functional
1.	Bosso	✓		✓	
2.	Bida		✓		
3.	Western Bye pass	✓		✓	
4.	Eastern Bye pass	✓		✓	
5.	Gwada		✓		
6.	Paiko	✓		✓	
7.	Maitumbi – Mobil	✓		✓	
8.	Keteren Gwari	✓		✓	
9.	Kuta	✓		✓	
10.	Stadium	✓		✓	
11.	Old Airport	✓		✓	
12.	Mypa Road		✓		
13.	Murtala Nyako	✓		✓	
14.	Bahago Drive	✓		✓	
15.	Yakubu Lami Road	✓		✓	
16.	Muazu Babangida		✓		
17.	Kpakungu road		✓		

Source: Authors' Field Survey (2017)

Pedestrian Islands, Pedestrian Overhead Bridges, Road Markings, and Road Signs

There are six (6) pedestrian overhead crossings along Bosso road and one on the Western Bye Pass. The pedestrian overhead bridges are rarely used and only serve as beautification for the streets, the Zebra Crossings are the common pedestrian crossing in the metropolis and there are about seven of them along the arterial roads although the marking have faded away and rarely used by pedestrians nor obeyed by motorists.

The major road signs noticed in the study area were the "Stop", "bus stop" and the "bumps ahead". Unfortunately, they are rarely obeyed by motorists Plates VII, VIII and IX shows typical road sign, pedestrian bridge and island in Minna metropolis.

Plate VII: A Bus Stop Sign along Bosso Road
Source: Authors' Field Survey (2017)

Plate VIII: A Pedestrian Overhead Bridge on the Bosso Road
Source: Authors' Field Survey (2017)

Plate IX: Pedestrian Island on the Old Airport Road
Source: Authors' Field Survey (2017)

CHALLENGES OF ROAD INFRASTRUCTURE MANAGEMENT

In an interview with the Chief Engineer at the Niger State Ministry of Works and Transport, questions regarding the challenges faced in the sustainable maintenance management of road infrastructures in the metropolis revealed the following outcomes:

- Funding: the officer stressed that inadequate funding is the major challenge facing sustainable road infrastructural development and maintenance in Minna metropolis. He emphasized that funds are not readily appropriated and released for the construction of new road infrastructures and the maintenance of existing ones.
- Improper award of road construction and maintenance contracts: the officer stressed that contracts are often awarded to contractors who quoted for cheaper rate without taking the

quality of the project output into consideration; this according to him often resulted to poor and substandard road projects in the metropolis.

- Difficulty in acquiring the necessary materials for construction, maintenance and Management of the roads: The Chief Engineer noted that it is sometimes difficult to acquire the required construction materials such as asphalt bitumen and earth moving equipments even when the fund is available to procure them.

The combination of these challenges hinders the sustainable road infrastructural development and maintenance in Minna metropolis.

CONCLUSION

This paper has assessed the quality of road infrastructure in Minna. From the various findings and discussions, it is safe to conclude that Minna is rich in road infrastructural inventory but most of these infrastructures are in very bad conditions and lack routine maintenance. This situation needs to be addressed in order to ensure an efficient mobility management in Minna in particular and Niger State in general. The study therefore recommended that proper funding of the road contractors and road management agencies by the State and local government will improve maintenance and provision of road complimentary infrastructures in the Minna metropolis. To ensure that this is sustainable, revenue for road maintenance can be generated by the State and local government through vehicle taxes, parking fees and fines from road traffic offenders and violators.

Alligator cracks on all roads should be sealed and all the potholes should be filled immediately in other to improve the road quality and reduce the spate of deterioration of the roads, reduce damages and maintenance costs to motorists. The damaged traffic lights should be repaired and provision of more traffic lights should be considered for all the arterial and collector roads. Furthermore, strict enforcement should be instituted by the Niger State Vehicle Inspection Office (VIO), while violators should be adequately sanctioned.

Furthermore, pedestrian crossings in the metropolis should be repainted and pedestrians should be enlightened on the benefits of using the facilities while also stressing the dangers of neglecting them. Finally, the drainage systems should be well maintained through regular clearing of the channels and tunnels to avoid blockages.

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