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TABLE OF CONTENT: FEBRUARY 2014, 3 (1)

Review

Fikirte Demissie Tulu

Integration of strategic environmental assessment into regional planningHerald J. Geogr. and Rgnl. Plann. 2014 [[Abstract](#)] [[Full Text PDF](#)] [001 - 015] Size 284kb

Full length Research Paper

Dukiya JJ, Zubairu SN and Ayuba P

The problems of articulated vehicles on-road parking at Mokwa and Tegna in Niger state, NigeriaHerald J. Geogr. and Rgnl. Plann. 2014 [[Abstract](#)] [[Full Text PDF](#)] [016 - 024] Size 699kb

CHINDO Musa Muhammad, IBRAHIM Musa Jaro, JOSHUA Jonah Kunda and SANNNI Ahmed Abubakar

Geo-information Study of the Spatiotemporal Growth of Karu, Nasarawa State, NigeriaHerald J. Geogr. and Rgnl. Plann. 2014 [[Abstract](#)] [[Full Text PDF](#)] [025 - 034] Size 2.45mb

Thomas Yeboah

Empowering residents to participate in Ghana's ecotourism projects: A study of some communities in the Brong-Ahafo regionHerald J. Geogr. and Rgnl. Plann. 2014 [[Abstract](#)] [[Full Text PDF](#)] [035 - 044] Size 380kb

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Full Length Research Paper

The problems of articulated vehicles on-road parking at Mokwa and Tegna in Niger state, Nigeria

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Vehicular parking activities are part and parcel of a roadway system, but the agglomeration of articulated vehicles within a portion of a roadway especially within the urban area is a major threat to the built environment and a challenge to environmentalists. In Nigeria and many developing countries, lives and properties are lost in road mishaps attributable to wrong on-road parking. Mokwa and Tegna are two towns in Niger state of Nigeria which are already having their share of articulated vehicle on-road parking anomalies. In an effort to solve this problem, this research examines the causes and the traffic implication of on-road articulated vehicle parking at Mokwa and Tegna with a view to determining the possibility of providing off-road parking for them. A parking survey was conducted at the two selected towns together with a stakeholders' meeting, and satellite imageries were also acquired to ascertain the level of tolerance and adoption of the proposed resettlement. The result reveals that the portion of the roadway has become a threat to other road users and a menace to the towns. It was also discovered that all the stakeholders including the drivers' union, are ready for the provision of a modern off-road park as soon as possible. This paper therefore recommends a Public-Private Partnership (PPP) approach for the implementation of the off-road modern park at Mokwa and Tegna.

Keywords: Articulated Vehicles, On/Off-Road Parking, Re-settlement, Traffic Management.

INTRODUCTION

Parking is the act of stopping a vehicle and leaving it unoccupied for more than a brief time. Parking on one side of a road is commonly permitted, but on both sides of a road is often with restrictions. Parking facilities are constructed on most highways, to facilitate the free flow of traffic, (AS 2890.2 .2002; Tim S. and Cherie U., 2007). But the agglomeration of articulated vehicles within a portion of a roadway especially at the entry or exit of a town is a major threat to the built environment and a challenge to the environmentalist. The government of any nation and transport stakeholders will like to achieve the following five objectives: Assist economic development, ensure safety and personal security, improve access and mobility, protect and promote public health and ensure environmental sustainability, (Desman Associate, 2009;

Tim S. and Cherie U., 2007; Christie et al, 2013; Carlo G. P. et al, 2011). The transport sector is faced with a growing number of global competitors that are keen to innovate and invest. Because of the fast-evolving world in transportation and the attendant mishaps, countries like Europe are trying to absorb innovative technologies and business models that will maintain its position as world leader in transport, (European Commission, 2012).

Indiscriminate parking of vehicles (trucks and trailers) on major inter-and-intra regional highways in the country has adverse impacts on human, social and economic well being of the nation. Loss of lives and destruction of property as a result of road accidents that are due to roadside parking are enormous. A sane society cannot allow this state of affairs, which caused the deaths of no fewer than 200 Nigerians in 2012 - including eight pupils of Itori Comprehensive High School, Itori, Ogun State, and 18 persons when a truck ran into stationary cars in Nkpor, Anambra State on December 11 - to continue for

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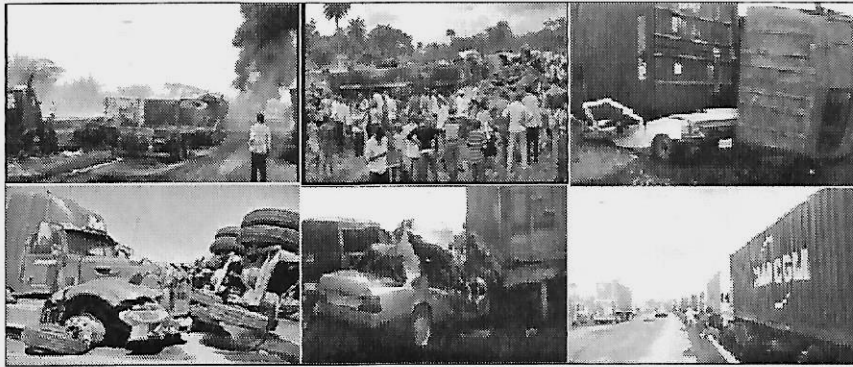


Figure 1. Multiple petrol tanker and trailer accidents on Nigerian roads, (2012, 2013).



Figure 2a, b, c, d, e and f. Identify Body and Trailer Types.
Source: (Freight Best Practice publications 2010).

much longer, (The Citizen, 2013; Ayodele O., 2013; Pmnews, 2011; David O., 2013; Ben-Nwankwo N., 2013).). In the last ten years Nigeria, about 50,990 deaths and 197542 injuries have been recorded on major roads, a total of 4,260 people were killed in accidents across the country in 2012 alone according to the official statistics from the Federal Road Safety Corps (FRSC, 2013), (see Figure 1 for scenes from such accidents).

The increasing trend of road crashes that is associated with articulated vehicle on-road parking in most parts of Nigerian cities and highways has prompted the local and state municipal authorities to evolve policies that can mitigate the mishaps as in the case of trailer/tanker's settlement schemes as in Lagos State. For instance, the Highway Code Rule 246 (which relates to the provisions of Section 19 of the Road Traffic Act 1988) states that: "Vehicles with a maximum laden weight of over 7.5 tonnes (including any trailer) **MUST NOT** be parked on a verge, pavement or any land situated between carriageways, without police permission. The only exception is when parking is essential for loading and unloading, in which case the vehicle **MUST NOT** be left unattended". But parking policies should not be

considered in isolation, but should support and take into account wider transport, economic development, urban design, environmental, social and recreational strategies that may exist at a local and regional level.

Definition of some Identify Articulated Vehicles Body Types

Articulated vehicles

Articulated vehicles have two parts: a motorised drawing unit known as a 'tractor unit' and a mounted trailer. The trailer is attached to the drawing unit through a specialised coupling usually known as a fifth wheel coupling. This has a groove and locks and is bolted to the chassis. The trailer has a pin fitted near to the front, known as a kingpin. The pin sits in the fifth wheel lock to couple the trailer and can be released by use of a lever. Power and braking to the trailer are provided via wire connections known as 'suzies'. The tractor unit can have a number of axles depending on the load weight the trailers used as in Figure 2. 'Landing legs' are fitted to the

trailers to support the front when not attached to the tractor unit, these are not always designed to be load bearing, (Freight Best Practice publications 2010).

Temperature-controlled Bodies

These consist of a rigid box made of insulated material and designed to carry temperature-sensitive (chilled or frozen) products. The bodies can be fitted to rigid vehicles or trailers. Most temperature-controlled vehicles operate a freezer or chiller driven by a separate engine or by the vehicle's main engine and generally include electric standby facilities, as in Fig. 2c, (Freight Best Practice publications 2010).

Step-frame Trailers

These are built on a box trailer; the design optimises the load space area by lowering the rear chassis with a swan-neck or with small rear axles, thus increasing the volume of the trailer. The upper surface of the major part of the load platform is less than 1m above the ground. They are either used for low weight goods, such as packaging and hanging garments or in the removal sector to carry bulky furniture, as in Figure. 2a, (Freight Best Practice publications 2010).

Trailer Tanker

These vehicles have a permanent tank fitted to a chassis for the transportation of liquids, gases or powders. Road tanker loading/unloading methods include gravity feeds, blowers and vacuuming. Tank bodies are frequently fitted to trailers and rigid vehicles, often multi-axle to maximise weight distribution, as in Figure 2d. Some tank operations include an internal liner to enable the transportation of mixed loads without the need to flush out the tank, (Freight Best Practice publications 2010).

Demountable 'Swap Body' Systems

In this system, the chassis is designed to carry multiple containers. Goods can be loaded independently of the truck at the central warehouse, enabling driver time to be fully utilised driving the vehicle. For example, a number of fully laden containers can be dropped overnight at a sub-depot by a single vehicle for next day delivery by small urban vehicles. Landing legs are fitted to swap bodies which allow the host vehicle to be driven under the body to couple it to the chassis as in Figure 2e, (Freight Best Practice publications 2010).

On-road parking

On-road parking can be generally described as that vehicular parking which is located alongside the edge of the road, and where manoeuvring into and out of a parking space may interact with traffic flow. It is often discouraged in congested areas, sharp bends and other areas that constitute hazards to other road users. Some definite areas are however marked and designed by the road shoulder to serve as emergency vehicle checking points and similar uses.

Off-Road Parking

Off-road parking is where the parking facility does not directly interact with the through traffic flow along a road other than at the access point between the road and the car park. This type of facility is required when demand for parking far outweighs the supply of on-road facilities and alternative parking areas are required, (AS/NZS 2890.1. 2004; Australian Design Rule 43/04, 1996; Australian Design Vehicles and Turning Path Templates, 2006). When providing off-road parking facilities for a substantial number of vehicles, a traffic impact assessment should be undertaken to assess:

- i. the impact of the generated parking traffic on traffic flows on the surrounding road network, including, as a minimum, the performance of the car park access,
- ii. the interaction of manoeuvring vehicles and pedestrians and the provision of suitable walking facilities within and to/from the car park,
- iii. any conflicting issues with adjacent side road and access ways, including site visibility,
- iv. the adequacy of queuing space within the car park to ensure vehicles do not block the approach roads.

Aim of the Study

The aim of this study is to examine the causes and the traffic implication of on-road articulated vehicle parking at Mokwa and Tgina, Niger State, Nigeria with a view to proposing a solution to the problems.

Objectives of the Study

- i. To identify and map the critical areas of the informal parking activities along that road;
- ii. carry out an on-road parking survey to determine the level of congestion and the reasons for parking;
- iii. carry out site suitability assessment of an already proposed areas for possible resettlement of articulated vehicles; and
- iv. conduct a consultative forum for the harmonization of needs and site acquisition



Figure 3: Stakeholders Meeting held at Rafi and Mokwa Local Government Council Chamber.

for the proposal.

Research Method

A reconnaissance survey of the studied highway was carried out to identify the nature of the parking problems and the various socio-economic activities that complement or otherwise the parking activities for proper questionnaire design. Mokwa and Teginna towns were selected for the purpose of this study, among other settlements along this trunk 'A' road, because of the volumetric parking and their strategic location. A road side parking and volumetric survey was conducted to estimate the spatial coverage of the articulated vehicles and the volumetric density. At both locations, two survey points along trunk-A road were selected at the entrance and at the exit of the towns with the survey crew computing both in-and-out traffic flows, while mobile parking survey was adopted to ascertain the parking turnover. Their Origin and Destination Survey (ODS) was also computed as it affects their duration of parking and the need to park. The nature of this study was such that required the use of GPS (Garmin 78 series), Digital Camera.

To determine the feasibility of producing an implementable off-road articulated vehicle park design for the areas, several consultative meetings were conducted with the major stakeholders (Truck/Trailer drivers executives, local government council, the Emirate Council, the Divisional Police Officer (DPO), the Federal Road Safety Corps (FRSC) Area Commander, and the Vehicle Inspection Officer (V.I.O). A total of 23 and 13 people participated at Mokwa and Rafi local government areas respectively. Public participation is a major condition for any functional community development; see Figure 3 for such forum.

For the secondary data sources, high resolution satellite imageries of the study area were acquired to give the real-time spatial distribution and relationship between the on-road parking and the adjoining land uses. Most of those settlements along the road have no Township

maps therefore the Topographical Sheets were acquired and updated to complement the acquired image for validation. Other necessary information was collected from police records, the Federal Road Safety Corps, the road transport unions' officials and literature. Parking space lengths for parallel parking were obtained (see Table 1) to act as a guide in off-road park design.

The Study area

This study focused on two critical locations on the Lagos-Kaduna-Kano Trunk-A road within Niger State in the middle belt of Nigeria which are Mokwa and Teginna. While Mokwa is the headquarters of Mokwa Local Government Area, Teginna is located in Rafi Local Government Area as indicated in Figure 4 and 5. The two towns can be said to be nodal towns as they are gateways to other northern states

Mokwa Town

Mokwa lies between longitude 6.0° - 6.3° E and latitude 9.0° - 9.5° N along the Lagos-Kaduna-Kano trunk A1 highway in the country. The road is known for its heavy vehicular traffic of trailers conveying bulk goods and services from south to northern part of the country and vice-versa. Mokwa is approximately 330 km away from the Federal Capital city of Nigeria (Abuja) and 220km from Minna the Niger State capital. There is a substation of the Lagos-Kaduna-Kano railway station in the town that is the commercial nerve centre of the settlement. It is also the gateway to the Kainji Hydro-electric power station and National Game Reserve Park.

Teginna Town

Teginna is another major settlement along the same Lagos-Kaduna-Kano trunk A1 road. The area of interest in the town is from the state capital (Minna) road junction

Table 1. Parking space lengths for parallel parking

Vehicle type*	Space length (m)	Space width (m)
Standard vehicle (car/van)	5.4/6.0	2.5
Taxis	5.4	2.5
Disabled (on-street)	6.0	2.5
Disabled (off-street)	6.0	3.5
Bus	12.0	2.5
Coach (using articulated vehicle)	19.0	3.5
Truck (small rigid vehicle)	6.4	3.5
Truck (medium rigid vehicle)	8.8	3.5
Car towing trailer	12.5	2.5
Truck (large rigid vehicle)	13.5	3.5
Truck (articulated vehicle)	18-20	3.5
Bicycle	2.0	1.2
Motorcycle	2.5	1.2

Source. Parking Control Devices Manual, Land Transport New Zealand, 2007

* The Land Transport Rule limits standard vehicles with their loads to a maximum height of 4.25 m. Normal clearance provided for most parking facilities is 4.5 m.

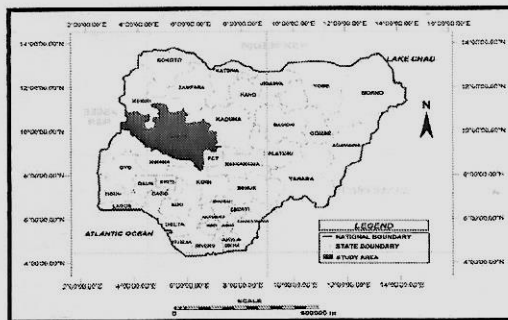


Figure 4. Niger State in the Context of Nigeria.

Source. Niger state Ministry of works, land and Survey.

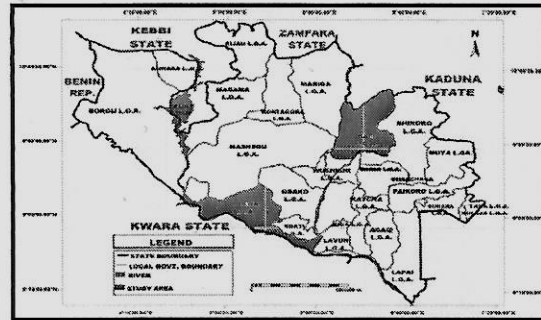


Figure 5. Mokwa and Rafi Local Governments areas in Niger State.

to Kontagora road junction along the same route.

Data presentation and Analysis

Mokwa on-road parking survey

At Mokwa, the major area of parking concentration by the trailer/lorry vehicles is from the entrance to the local government secretariat to the exit of the town toward Minna-Bida road. A volumetric parking survey conducted within this area reveals that an average of eight hundred and fifty (850) vehicles park in Mokwa per night. Also the traffic flow survey carried out on this trunk 'A' road at entry to Mokwa from Kainji road junction and at the exit of the town reveals that apart from the intra-township vehicular flow of motorcycles and taxis, articulated vehicles/tankers had the highest frequency as depicted in table 2 and 3 and in Figure. 6 and 7.

Tegina on-street parking Survey

The situation at Tegina is almost the same with that of Mokwa except that the average daily articulated vehicle volumetric night parking is five hundred and seventy-five (575). The parking location at Tegina is very critical because of the major road intersection in the area. This is the point where the Kontagora-Sokoto road is linked to the Lagos -Kaduna trunk 'A' road. To the south about 1.5km away, is the Minna road intersection. Night double-parking sometimes extends from Kontagora road junction to Minna road junction which turns the entire roadway to a tunnel-like situation of less than 6m width dual carriage road. (See the critical situation as revealed in Figure 8 and 9).

Reasons for Parking at both locations

The oral interview survey conducted reveals that

Table 2: Traffic Survey of Mokwa-Bida Road Location A

TYPES OF VEHICLE	11am -12noon		12noon -1pm		1pm - 2pm		2pm - 3pm		TOTAL
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	
Private Cars	13	9	10	8	12	15	20	11	98
Motorcycles	62	73	89	99	83	66	53	52	577
Pick-ups	6	0	1	0	1	0	0	0	8
Tankers	21	9	13	17	17	18	10	13	118
Trailers	33	18	16	30	13	30	16	20	176
Commercial Buses	7	14	11	11	20	21	10	7	101
Tippers	2	1	0	2	3	0	0	0	8
Scooters	1	0	1	0	0	0	0	0	2
Bicycles	0	2	1	1	2	0	2	0	8
Special Vehicles	3	4	5	1	0	1	0	0	14
TOTAL	148	130	147	169	151	151	111	103	1110

Source. Author's Field survey.

Table 3. Traffic Survey of Mokwa-Bida Road Location B

TYPES OF VEHICLE	11am -12noon		12noon -1pm		1pm - 2pm		2pm - 3pm		TOTAL
	IN	OUT	IN	OUT	IN	OUT	IN	OUT	
Private Cars	36	20	48	21	64	25	14	6	234
Motorcycles	73	10	115	9	133	6	34	9	389
Pick-ups	5	0	8	3	2	5	0	2	25
Tankers	24	11	21	19	28	19	14	2	138
Trailers	18	29	34	24	36	34	19	8	202
Commercial Buses	14	11	19	6	21	7	8	6	92
Tippers	0	0	3	3	3	0	0	0	9
Scooters	0	0	0	0	0	0	0	0	0
Bicycles	2	0	0	0	1	0	0	0	3
Special Vehicles	2	3	3	1	0	3	0	0	12
TOTAL	174	84	251	86	288	99	89	33	1104

Source. Author's Field survey.

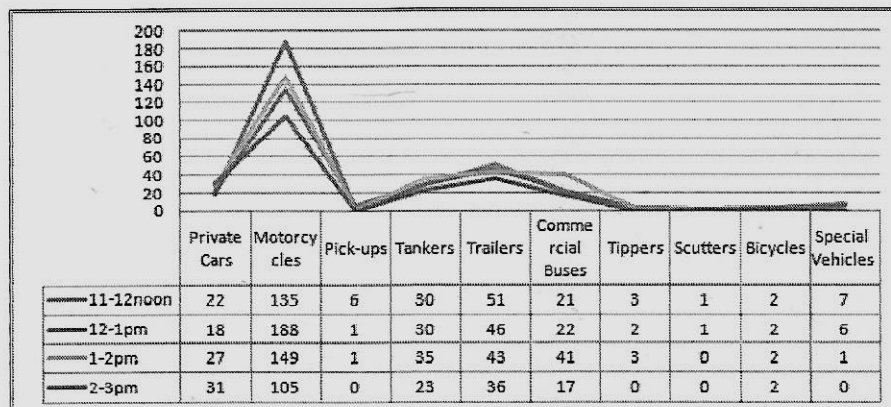


Figure 6. Traffic flow survey at entry to Mokwa from Kainji road junction (2012)

Source: Author's analysis.

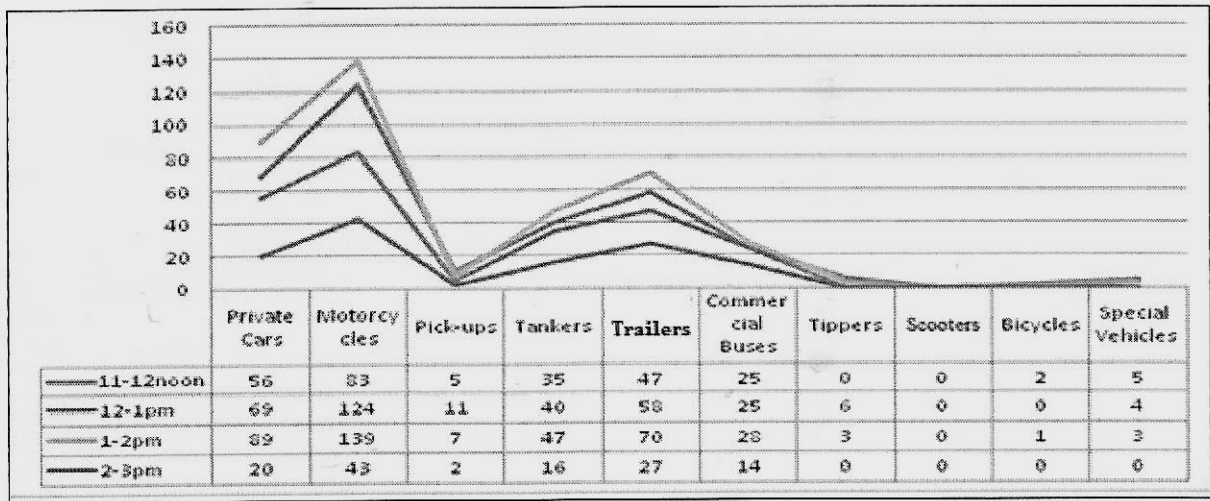


Figure 7. Traffic flow survey at the exit of Mokwa toward Minna (2012)
Source. Author's analysis.



Figure 8. Imagery of On-road parking at Teginia Trunk 'A' Road.
Source. Google Earth.



Figure 9. On-road double parking at Mokwa town Along Lagos-Kaduna on Trunk 'A' Road, (2012).
Source. Author's Field work.

articulated vehicle drivers generally stop to examine the mechanical condition of their vehicle after 200km to 250km journey drive, the nature of the road and human factors may also influence the rate of stoppage. Mokwa is a major strategic location along the Lagos-Kaduna trunk 'A' road between Ilorin and Kaduna. The size of the town and the hospitality of the people they said; attract the travellers to have a feel of the socio-cultural life style of the people. Also bandwagon effect and security are other major factors give for the choice of resting place by the drivers.

Teginia is on a major road node (junction) where Kontagora and Minna roads link the Lagos – Kaduna trunk 'A' road. It also acts as a stop-over place for vehicles bound for the major towns (Sokoto and Kaduna) from Lagos. Articulated vehicle drivers therefore regard that location as a suitable parking place.

Proposed Areas for the Resettlement

After consultative forums with the stakeholders and site analysis survey, a site each were selected for the resettlement at the two towns. At Mokwa, the site is located toward the exit of the town toward Minna along the proposed bypass junction to the existing Lagos-Kaduna road. The length of the site measuring 2km is parallel to the national NEPA grid line where it crosses the road before entering the town, and the breadth measuring 1.5km is facing the proposed bypass, see Fig. 10 for the site location. The only environmental constraint in the site are the NEPA national grid power line, the existing bare surface frontage road and the proposed bypass that will amount to double frontage for the site. All these are just acting as external boundary to the site that can be professionally handled.



Figure 9. The site at Mokwa.
Source. Adapted from Google on-Line.



Figure 10. The site at Tegna
Source. Adapted from Google on-Line.

The site at Tegna is located at about five hundred (500) metres away from Kontagora junction to the Lagos – Kaduna road. It is sandwiched between the two roads northwest. At the eastern boundary is petrol filling station and to the west, it is bounded by a small seasonal river tributary that flows north-southward. At this site, the only noticeable and insignificant constraint is the adjoining petrol filling station and the dual frontage (Lagos-Kaduna and Kontagora roads) that tend to pre-determine the placement of some proposed facilities in order to achieve functionality of the entire area, see Figure 10.

FINDINGS

- i. Indiscriminate parking of vehicles (trucks and trailers) on major inter-and-intra regional highways in the country has adverse impacts on human, social and economic well being of the nation. K
- ii. Mokwa and Tegna in Niger State are one of the major towns along Lagos-Kaduna trunk 'A' road that is overwhelmed with articulated on-road parking problems.
- iii. A volumetric parking survey conducted within this area reveals that an average of eight hundred and fifty (850) vehicles park in Mokwa per night.
- iv. The situation at Tegna is almost the same with that of Mokwa except that the average daily articulated vehicle volumetric night parking is five hundred and seventy-five (575).
- v. Niger state has had severally their own share of the menace of articulated vehicle road mishaps as evidenced at kudu and Lambata-lzom area recently.
- vi. The stakeholders' consultative forum reveals that the articulated vehicle drivers are willing to resettle into modernized off-road parking areas if developed to their taste with ancillary services.

CONCLUSION

Articulated vehicle accident related cases are usually

fatal and multiple involving tens and sometimes hundreds of lives lost on the major highways. Roadside or on-road parking by articulated vehicles at both Mokwa and Tegna in Niger State of Nigeria has become a perturbing environmental issue necessitating a study like this. The tunnel-like situations created in those parking locations are detrimental to the road users and the host community at large. Articulated vehicle accidents have claimed more than thirty (30) lives and destroyed properties worth millions of naira within the year 2013 within the state; the most recent ones is at Kudu and Lambata-lzom episode. The need for the government to take action is very urgent.

RECOMMENDATIONS

Acquisition and Stakeholders' Resettlement Adoption

The most effective and best planning solution for this articulated vehicle on-road parking is the establishment of purpose designed off-road parking for the resettlement of those articulated on-street parkers. Land acquisition procedures generally are sensitive and complex across cultures worldwide. It is therefore imperative to carry out a stakeholder consultative forum in order to ascertain the level of willingness of the local council, the emirate council, the union of trailer drivers and the law enforcement agents to adopt and comply with any resettlement scheme.

Constraint management in the Sites

The existing developments at Mokwa should be incorporated into the design by buffering. These features include the NEPA national grid power line, existing bare surface frontage road and the proposed bypass that will amount to double frontage for the site. While at Tegna, the adjoining development like the petrol filling station

and the dual frontage (Lagos-Kaduna and Kontagora roads) that tend to pre-determine the placement of some proposed facilities should be handled professionally for site functionality.

Public-Private Partnership in the development of the off-road park

Public-Private Partnership (PPP) is the best approaches to off-road public trailer park especially in the local government areas as it ginger-up the sense of belonging in the sustainable management of the park. The state, the LGA and the private investor are expected to be shareholders in the project for sustainability. PPP based projects do not die with political office holders as they are based on the characteristics of partnership ventures.

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