THE USE OF ROUNDABOUT IN ROAD SAFETY /TRAFFIC MANAGEMENT AND ECONOMIC DEVELOPMENT OF CITIES (A STUDY OF OWERRI, IMO STATE OF NIGERIA.)

[1]Chikezie Okoronkwo ESQ., FNIVS, RSV, MNISN. & [2]Adekunle Awolaja FNIVS, RSV.
[1]Department of Estate Management
Federal Polytechnic Nekede Owerri, Imo State
[2]Lagos State Valuation Office, Alausa Ikeja, Lagos.

Abstract
The chaotic state of our roads and traffic in Nigeria has reached a crescendo that almost every day without exception road accidents and mishaps occur. This is most prevalent not just on the highways but also inside the cities. The streets of Lagos has for a very long time been associated with traffic holdups and bottle necks. In Owerri, the capital of Imo State, the story is not different. Long queues of vehicles have become the order of the day especially this period that the administration of His Excellency Rochas Okorocha is carrying out various development projects to uplift the status of the capital city. This study examined the use and contributions of traffic Roundabouts in road safety and traffic management of cities. The study concluded that irrespective of the spatial distribution of facilities in any city, the construction and development of aesthetically pleasing roundabouts not only beautifies the city but also eliminates the most deadly crashes at intersection, improves traffic management and control as well as enhance the economic well being of citizens.

Keywords: *Roundabout, Traffic Management, Economic Development, Auto crashes, Right of way.*

Background to the Study
A traffic roundabout is a type of circular intersection or junction in which road traffic is slowed and flow almost continuously in one direction around a central island to several exits unto various intersecting roads. It is a development that has existed for many years and that has proved to be helpful in the management of traffic bottlenecks in the cities. The word Roundabout succeeded traffic circles that was first used in the United States where entering traffic is either controlled by stop signs, traffic signals, or is not formally controlled at all and speed of vehicles may remain unchanged. The term Roundabout is however reserved for circular flow intersections where entering traffic must yield to traffic already in the circle, so that traffic is calmed and flow through the intersection is maximized along with the highest safety for road users be they pedestrians or cyclists. Though not all roundabouts are circular, a common feature is that traffic flows in a loop.

The history of roundabouts could be traced to the Roman empire but were standardizes in the United Kingdom after improving on the experience of traffic circles built in the United States of America following World War II. Modern roundabouts are now common in countries around the world.

The Study Area: Owerri, Imo State of Nigeria
Owerri is the capital of Imo State of Nigeria. It is situated on latitude 5.290 N and longitude 7.290 E. Politically, Owerri came into being an administrative seat of governance in 1919 through a nationwide

classification exercise by the British Empire. Owerri was classified as a third class township as was Aba and Umuahia and Okigwe. In 1963, Owerri became the divisional headquarters of the newly created Owerri division in Eastern Region of Nigeria. In 1976, Imo State was created and Owerri became the capital of the new State. It was also designated the headquarters of Owerri local government by virtue of the Local Government Edict of 1976. The city as we know it today has passed the 843.541square kilometers area as gazetted under the Imo State Capital (Special Provisions) Edict No. 1 of 1976 and Imo State Capital (Special Provisions) (Amendment) (No. 2) Edict No. 6 of 1976. A master plan was developed to aid the rapid economic, political and social development of the city.

Methodology

This study examined the points in the city that urgently require the development of roundabouts. The table below may not be exhaustive.

S/No.	Point	Required Category	Status	Category	Remark
1	Government House/Library/Okigwe Rd/Bank Rd	A	D	A	Good
2	Wetheral/MCC/School Rd	A	ND	A	-
3	Wetheral/Aladimma/Osuji Rd	A	ND	A	-
4	Wetheral/Mbaise/Egbu Rd	A	D	C	Fair
5	Wethera/Douglas/Emmanuel College	A	DP	A	-
6	Aba Rd/Naze/Nekede	A	D	A	Fair
7	Naze/Egbu/Road Safety	A	DP	A	Poor
8	FUTO/PH Rd/Umuokanne	A	ND	A	-
9	FHE Umuguma/PH Road	A	ND	A	-
10	Fed. Sec./PH/ Ahiajoku Ctr	A	ND	A	-
11	PH Road/House of Assembly	A	ND	A	-
12	Dreamland/World Bank	A	D	C	Poor
13	Fed. Sec/World Bank	A	D	C	Poor
14	Emmanuel College Bypass/Old Nekede	A	ND	A	-
15	Akanchawa/Attan Ogoh	A	D	C	Poor
16	World Bank Rd/Musa Yaradua	A	D	C	Fair
17	Musa Yaradua/PH/Concorde	A	ND	A	-
18	Assumpta	A	DP	A	Good
19	Hospital Rd/Warehouse	A	DP	B	Fair
20	NNPC Mega/Rapour	A	ND	A	-
21	Akwakuma/Ubomiri/Mbieri	A	D	C	Fair
22	Nworieubi/Ifakala/Mbieri	A	DP	B	-
23	Okigwe Rd/Mbieri/Uratta	A	D	C	Poor
24	Hardel /Okigwe Rd	B	ND	B	-
25	Okigwe Rd/IMSU	A	DP	A	-
26	Mbieri/Ibeto Hotel/Amakohar Orji	A	D	B	Fair
27	Orji/Toronto/Road Safety Egbu	B	D	C	Poor
28	MCC/Chukwuma Nwaoha Rd.	A	ND	A	-
29	Catol/Bishop's Court/ Owerri Sports Club	A	ND	A	-
30	Imo Newspaper/Egbu Road	B	ND	B	-
31	Egbu Rd/Relief Mkt	B	ND	B	-
32	Wetheral Trunk/Aba Rd	B	DP	B	Fair
33	Emekuku Mission/Emii / Ihitta Ogada	B	ND	B	-
34	MCC/Relief Mkt	B	ND	B	-

Key

Category: A – First Class; B – Second Class; C – Third Class
Status: D- Developed; ND – Not Developed; DP – Developing
Remarks: Good – Developed accordingly; Fair - Developed below standard and expectation; Poor –

Table 2.
Roundabout Development in Owerri, Imo State

S/N.	Developed	Not Developed	Developing
1	11	16	07

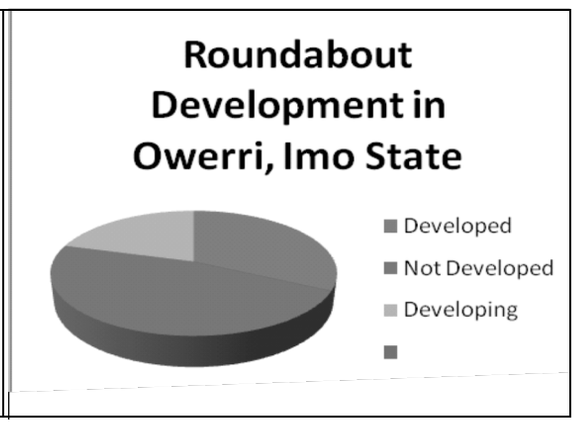


Fig.3. Roundabout development in Owerri, Imo State

Discussion and Findings

A scan through the table reveals that out of the 27 twenty seven category "A" roundabouts, 4 (four) have been developed or are being developed, whereas 11 (eleven) were developed to lower categories. Of the six (6) category "B" roundabouts, two are developed/being developed one of which is being developed to a lower standard. Eleven roundabouts have been developed; sixteen have not been developed while seven are being developed.

Fig. 4. Library/Government House Round about, Owerri Imo State.

A study of the Akwakuma/Ubomiri/Mbieri roundabout (S/No. 21) revealed that prior to its development in 2010 the junction was a constant headache to motorists, pedestrians and business. There was always a traffic jam that a time came when businesses and residents started avoiding the location. Civil servants were quick to blame their increasing rate of lateness and absenteeism to the chaos always witnessed at the junction. Traders and business executives could not easily access the Umuonyeali Mbieri industrial market,

resulting in slow capital accumulation and expansion of the market. Residents told tales of woe and frustration as they waited on the queue for hours, loosing precious man hour every day. An attempt to quantify the financial and social losses was made by the immediate past administration of the State. It was discovered that as much as Three billion, Seven Hundred & Fifty million Naira was lost per annum through various means owing to the situation at the junction.

The development of the roundabout in 2010 eased off the losses and contributed to the mild growth being witnessed at the Umuonyeali industrial market. School children now get to school early while the rate of lateness of civil servants commuting to work from the neighbourhood of the roundabout has reduced. Traffic now flows fairly.

Fig. 5 (a) Warehouse/Freedom Square Roundabout (under construction)
(b) Naze Aba Road Roundabout

Roundabout and Traffic Management

Research has shown that roundabouts can improve the reduction of vehicle stops and delays, reduce traffic speeds, and increase safety compared with other intersection designs. They are also used to provide a gateway or aesthetic feature. As a result, roundabouts are once again being promoted by traffic engineers and planners, and are an important Traffic Calming tool. They are increasingly common throughout the world. To maximize safety and establish consistency it is very important that all roundabouts be designed (and existing ones redesigned) to reflect Modern Roundabout principles.

Table 3: Roundabout in Road Safety and Traffic Management: Safety Impacts of Traffic Calming Measures
(The Owerri, Imo State Experience)

Measure	Number of Observations	Average Number of Collisions		% Change in Collisions
		Before	After	
12' Humps	56	3.5	2.8	-20%
14' Humps	43	5.7	3.8	-33%
22' Tables	-	-	-	-
Circles (Roundabout)	110	4.2	1.4	-67%
All Measures	209	13.4	8.0	-40%

Source: Centre for Real Estate Economics Owerri, Nigeria (2011 -2012)

Table 4: Roundabout in Road Safety and Traffic Management: Safety Impacts of Traffic Calming Measures (US experience

Measure	Number of Observations	Average Number of Collisions		% Change in Collisions
		Before	After	
12' Humps	49	2.7	2.4	-11%
14' Humps	5	4.4	2.6	-41%
22' Tables	8	6.7	3.7	-45%
Circles (Roundabout)	130	2.2	0.6	-73%
All Measures –	192	2.6	1.3	-50%

Source: (Ewing 1999; www.trafficcalming.org)

A study by the US Insurance Institute for Highway Safety found that traffic roundabouts which replaced conventional intersections reduced total crashes by 39% and injury crashes by 76%, and estimates that fatal and incapacitating injury crashes could be reduced about 90% (Persaud 2000). These results are consistent with other international studies.

Roundabout and Economic Development

Transport contributes directly to economic activity and employment through bus, rail, road, air and maritime services. It also has a large indirect impact via all the other sectors and activities in the economy that depend on and use these various modes of transport to move people and goods around, nationally and internationally, in an efficient and safe manner. A good transport system is one that facilitates the movement of goods, personnel and services from one point of the city to the other. The roundabout is one of those traffic development strategies that reduces clog of vehicular and pedestrian traffic thereby facilitating the easy movement of goods, personnel and services across the city.

The Warehouse/Freedom Square roundabout is a case in point. This spot which was hitherto noted for its extreme chaotic environment has given previous administrations of the municipality and State a serious cause for concern. Indeed a time came when it was noted as a den of robbers who openly carried out their nefarious activities even in broad daylight. Consequently, tourists and visitors who used to patronize the first government owned Imo Hotels Limited located in the vicinity reduced their patronage. This resulted in the gradual but steady decay of the infrastructures in the hotel. The Imo Hotels Limited was not the only casualty. Fuason Industries Limited (FIL) which used to pride itself as the best among equals in Nigeria suffered an almost irreparable damage. The industry used to specialize in the corrugation and coating of the best quality zinc sheets under the brand name of "Three Star". Their products were sought all over Nigeria because of the thick gauge.

Today, Fuason Industries Limited (FIL) is no more in existence. It died because of the hiccups associated with the nerve breaking, hair stirring bedlam and strictures of human and pedestrian traffic of the junction. Many times, distributors of the products of Fuason Industries Limited were held spellbound by the nature of the traffic at the point which was unprecedented. Tales of rampaging hoodlums who took care of the situation of the junction to satisfy their nefarious ambitions were rife. Today, the site of Fuason Industries Limited is an imported auto display site. In the current economic environment, transport plays an even greater role in driving jobs and growth. Many cities' transportation systems are facing rising demand driven by increased urbanization of populations. Even cities with declining populations face challenges since

declining demand exacerbates existing revenue problems. Whether populations are increasing or declining creates a challenge for transportation providers in terms of maintaining an efficient and productive transport system in the face of population changes. In addition, a challenging financial environment combined with languid economic growth constrains the use of traditional fiscal instruments to support job creation, as well as creating affordability and funding issues for large infrastructure investments. Yet, at a time when transport has never been more important in supporting growth and job creation, transportation systems all over the world especially in Lagos and Owerri are facing significant challenges, such as those related to congestion, safety and the environment.

The development of roundabouts can become a differentiator for cities to attract and retain the talent necessary to drive growth, as they have a critical influence on the attractiveness and livability of a location. For cities and regions that can attract the right talent, the resulting wealth can be spread out across the economy. Owerri seems to acknowledge this fact and is about tapping into it.

Conclusion

Since the creation of Imo State in 1976, it is only recently that the importance of roundabouts is being harnessed. The democratic government of His Excellency Rochas Okorocha deserves a pat on the back for this. The administration has embarked on the development of many roundabouts not just in the capital city of Owerri but in other cities especially Orlu, Okigwe, Umuaka, Oguta, and many others

Aesthetically developed roundabouts help the growth of smarter transport systems that address economic growth and opportunities. To sustain momentum, governments need to accelerate the development of roundabouts for the beautification of the city and the enhancement of the economic well being of the citizens.

Recommendations

Roundabouts should be designed and constructed such that the centre or what is generally referred to as the "Island" is used for many other things. Signs usually direct the traffic entering the circle to slow down and to yield to "right of way". In Nigeria and many other countries that practice right hand driving that is driving at the right hand side of the road, the "right of way "is for those on the left.

The centre of the roundabout provides in addition to the direction of traffic, a visual barrier across the intersections to the drivers entering it. This functions to assist the drivers into focusing only on the traffic coming towards them in the part of the circle. The beauty of this design is that it significantly reduces the conflict of concerns commonly encountered at intersections. When drivers can see across a roundabout, if there are any other vehicles in any other part of the device, drivers are better guided to stop outside the roundabout rather than merging waiting for the vehicles even on the opposite side to come around and pass them. This interferes with the flow of traffic through the intersection where many vehicles should be able to circulate in the roundabout at the same time.

The "Island" may be a landscaped mound, a raised wall or thickly planted very tall shrubs. Flag poles at the top of the landscaped mound in a roundabout are popular items. In Owerri and other cities of Nigeria, the area is used as monuments, for the display of large public arts and sometimes for a fountain although this is not very advisable for obvious reasons.

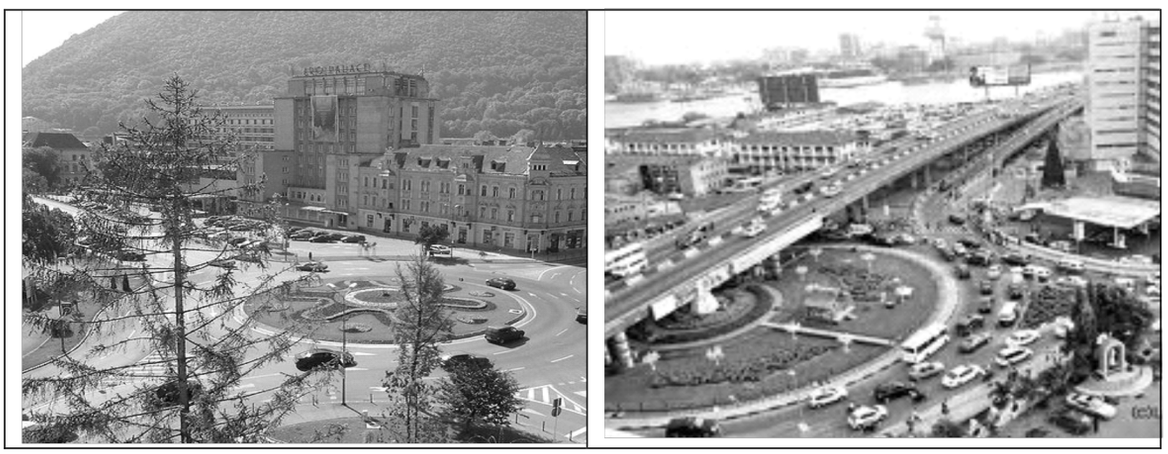
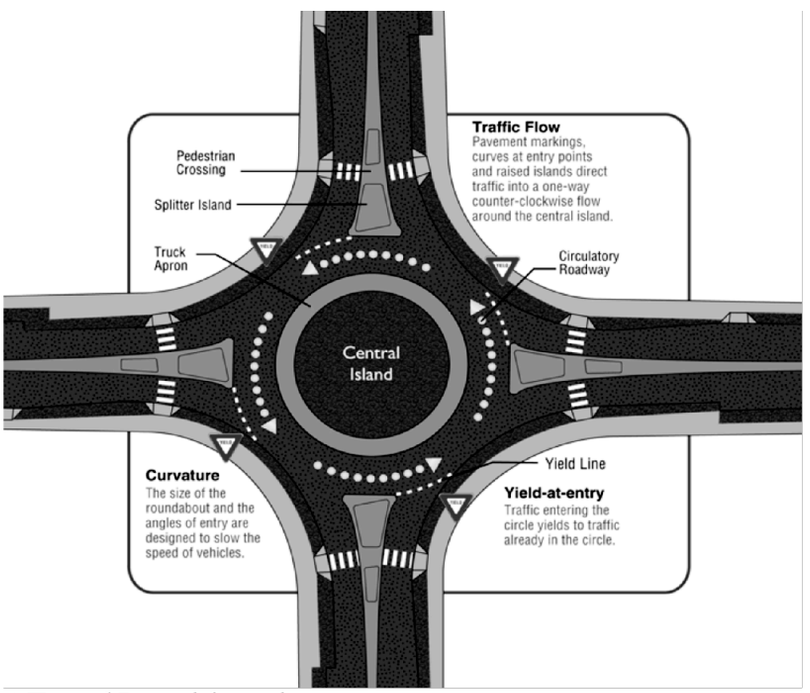


Fig. 2 (a) Roundabout in Brasov, Romania; where roundabouts are a common thing.
(b) Falomo Roundabout, Lagos Nigeria. Notice the busy traffic. The flyover helps to decongest the roundabout.



RTFig. 1 Typical Roundabout design

It is recommended that the design of roundabouts conform to standards and follow principles that will enable it contribute to effective management of traffic and economic growth of the city. These standards and principles are itemized

1. The size of the roundabout is important. It has been proved that the larger/bigger the size, the more effective it is to control and regulate the flow of traffic.
2. The size of the roundabout and the angles of entry should be designed to slow the speed of vehicles.
3. There should be pavement markings, curves at entry points and raised islands that should direct traffic into a one way counter clockwise flow around the central island.
4. The necessity of splinter islands cannot be over emphasized as they divide the roads and aid pedestrian crossing.

5. The width of the road at roundabouts ought to be fifty percent (50%) bigger than the usual to encourage compliance of traffic entering the circle to yield to traffic already in the circle.
6. The radius of the roundabout and the angles of entry, created by the design of the medians and the center island should be such that will slow the speed of all vehicles to around 15-25 mph. This prevents the intersection from "locking up" which could happen if the traffic in the roundabout would have to stop for entering traffic.

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