

Gis-Based assessment Of Traffic System In Osisioma Ngwa L.G.A, Abia State.

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ABSTRACT

Geographic Information System (GIS) technology is a tool that was used to gather, store, analyze, and visualize data about the city's traffic flow, including information on roads in Osisioma Ngwa L.g.a. in Aba Abiastate. The objective is to make better decisions based on accurate and current information in order to increase the sustainability and efficiency of Osisiomatraffic flow. This could involve things like streamlining public transit lines, lowering traffic and pollution levels, and enhancing accessibility for all locals. An overview of the main GIS data models for traffic analysis is provided in this project effort. Based on that, a route database for the city of Osisioma is created in a GIS context. The GIS database displays all the elements involved in routing and analyzing traffic flow, including nearby land use in the city, various modes of transportation, and routes for these modes, the city's road network, and more. The most likely reasons of traffic congestion in Osisioma LGA were short road width, poor pavement, and indiscriminate parking of vehicles along the road corridors, mainly by commercial cab drivers, according to an analysis of the results and other performed queries. In conclusion, it was found that the Donald junction route. Mcc junction route and the Osisioma Flyover are the most crowded sections of the whole road networks evaluated. This project shows how the application of GIS has helped in the proper assessment of the causes of traffic congestion in osisiomaNgwaL.g.a, provide Adequate policies and enforcement should be put in place so as to eradicate indiscriminate parking of vehicle on the road and reckless driving and not obeying the traffic light. **Keywords:** GIS, ArcGIS, Geographic Coordinates, Geodatabase, Traffic flow.

The rapid urban expansion during the last decade caused by the socio-economic growth of modern society based on technology has major repercussions on urban mobility (Gonzalez, 2008). Besides the environmental impact, most urban centers face problems concerning the mobility, the transport infra-structure being overcome and causing frequent traffic jams (Jingyuan Wang et al., 2014), which reduce the efficiency of transportation by increasing the time travel for relative short distances, augmenting the fuel consume and producing air pollution (Beliki&Brockmann, 2014)

Nowadays, mobility is essential for the economic development to take place, both locally and regionally, influencing the people wealth fare and that is why policy makers must focus on transport efficiency and sustainability. Although the road density is high, for most cities it became insufficient and road extension is not a viable solution anymore, especially inside the cities, mainly because of urban land use (high price of land, historical centers closed for traffic circulation). Also, extending the road infrastructure and encouraging urban mobility based on motorized transportation generates a vicious circle which will cause the exponential increase of the number of cars (García-palomares et al., 2018)

Urban transportation systems become highly congested frequently in many cities around the world, especially in some developing countries such as China, where travel demand increases so rapidly that network can hardly provide enough supply. Even in developed regions like Hong Kong, where vehicle quantity keeps stable in a relatively long period, congestions frequently occur. 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 (Oluwole&Ojekunle, 2016) The

I. INTRODUCTION

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 (Beliki&Brockmann, 2014; Lee et al., 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).The urban areas of most industrialized towns are clogged with road traffic. In such towns as Aba, the cars seem to outnumber the people. Traffic often moves so slowly that streets become virtual parking lots. Even the building of multilane expressways has not alleviated the problem. Added to the congestion, there is ever-worsening air and noise pollution, a rising toll of accidents and fatalities, and frequently inadequate public transportation.Traffic congestions in Aba induces pressure on traffic flow and makes living in Aba urban area difficult and is characterized by slower speeds, longer trip time and increased vehicular queuing. All these, may make drivers becoming frustrated and engaging in road rage.

The transportation system in urban centers of Nigeria is beset with numerous challenges. Generally, the analysis of Nigeria's transport system revealed a sector suffering from warped or defective developmental approach (Badejo, 2011). There is evidence of skewed modal development tilted in favor of road transportation to the disadvantage of other means of transportation.

Demonstrating its predominance, road transportation accounts for about 90% of both freight and passenger transport in Nigeria; in a sharp contrast to its natural advantage of being good for short to medium distance freight haulage. Nowadays, road transport is almost solely responsible for the carriage of bulk goods throughout the length and breadth of the country. Whereas goods arriving by water are economically cheap to be transported from the port by rail or inland waterways, the ports, except in the case of Port Harcourt and Apapa ports have neither rain nor waterways connection leaving road as the only option. This obviously constitutes improper use of the road and unfortunately has translated into a huge national burden; affecting smooth flow of traffic in urban centers.

In a nutshell, the urban transport challenges in Nigeria today include traffic congestion, parking problems, accidents and environmental pollution

which the study area is not left out. In some major cities, vehicles are seen crawling on the roads especially in both the morning and evening peak spheroids. This amounts to daily loss of time and energy in our various urban centers.

In most cities, majority of the urban populace depend on public transport for their mobility needs; this is dominated by the private sector operating such vehicles as taxi; para-transit mini buses, fare paying passenger carrying private cars (also known as 'kabukabu') and motorcycles (two wheel) and three-wheeled motorcycles operated in most urban centers. In most cities, demands for parking far outweigh available supply.

According to (Urmson et al., 2008) inadequate parking space accounts for 34% of parking problems in Lagos. Noise pollution is also a noticeable feature in urban centers.

The rapid growth of urban population and the horizontal motion of city put serious pressure on existing urban facilities and infrastructure of which the physical mobility is included. The issue therefore remains how to use available urban space to meet the conflicting and ever increasing demands for infrastructure and services and the overall development of the city.

STUDY AREA

The study area, Osisioma (ABA) which is nicknamed "CITY GATE", is one of the major towns in Abia State of Nigeria .It is located between latitudes 05° 5' 57" N and 5° 19' 32" N of the equator and longitudes 07° 15' 49" E and 07° 25' 23" E of the Greenwich meridian. This one of the popular L.G.A that makes up Aba as a Town.

The indigenes of the town are the Ngwa people and they are mostly Christians . Aba is in southeastern Nigeria which lies along the west bank of the Aba river, at the intersection of roads from Port Harcourt, Owerri, Umuahia, IkotEkpene and IkotAbasi (Opobo)

II. METHODOLOGY

The step by step procedure adopted in carrying out this research is documented in this section. It covers database design, data source and data acquisition, system selection, data conversion and database creation. Office reconnaissance was carried out by viewing the specific area of study on Google Earth imagery, using the Google features, the name of places where clearly seen. The office reconnaissance involve sourcing for a good spatial data of the project area and it involve the process of



figure 1.0:

Map of Study Area.

acquisition of high resolution satellite imagery (sentinel) of the project area. However, a high resolution image was used because details that are to be captured require a clear view, so that every detail can be identified and digitized out. The instrument that is to be used for the project was also put in to consideration.

To be able to acquire all necessary information and data for the project the following software and hardware was used: ArcGIS 10.1, Google Earth, Microsoft Excel 2013, Microsoft Office Excel 2013, Hand held Global Positioning System (GPS), Field Book.

SPATIAL AND ATTRIBUTE DATA

The following data were used for the project:

- i. Remotely sensed data (sentinel high spatial resolution)
- ii. Ground survey data (GPS ground truth data X, Y coordinate)
- iii. Attribute data of road (road name, width, and lane)

DATA SOURCE

The data source which was used for this project was acquired from the office of the Surveyor General Abia state where the base map of the study area was sourced and also include the satellite imagery which was Downloaded from GoogleEarth. Direct interview and observation in the study area was employed to acquire the road attribute such as road name and important places name, lastly traffic data was collected from some major road in osisioma.

ACQUISITION OF PRIMARY DATASET

The primary dataset obtained through field visits were:

- Spatial data was acquired using GPS
- Attribute data: This involves data that contain nonspatial descriptive information of such points of interest.

ACQUISITION OF SECONDARY DATA

The secondary data were gotten from digitization of available map data and attribute data and some information collected from facilities include;

- i. Abia map depicting road network, towns and locations of sites of interest.
- ii. Administrative map of Abia State which

depicts local government boundaries.

GLOBAL POSITIONING SYSTEM (GPS) OBSERVATION

The ground coordinate of road and keke point were observed on the field. The X, Y coordinates features within the study area was obtained with the GPS.

**DATA PROCESSING
 IMAGE PROCESSING**

This involves eliminating and improving the quality of the satellite imagery, the image processing done on the acquired satellite imagery was geo-referenced and preferred coordinate system.

COORDINATE SYSTEM

GEOMETRIC DATA CAPTURING (DIGITIZING)

The process of digitizing is a process of converting raster dataset in to vector format. It involves the extraction of roads and boundaries of the study area using satellite image as linear features. In this way a final digital image of major transportation route is prepared in the GIS environment.

CAPTURING OF ATTRIBUTE DATA

A copy of the map that was digitized was printed and taken to the site for completion exercise. Whereby attribute data of features like road name,

A coordinate system was adopted for the image, the coordinate system chosen for the execution of this project was.

- i. Projection: UTM
- ii. Datum: Minna
- iii. Zone: 32N
- iv. Ellipsoid: CLARKE 1880

Geo-Referencing Of The Map

The Map was geo-referenced to aligning

Table 1 showing Geo-referenced coordinate S/N POINT ID

	EASTHING COORDINATES	NORTHING COORDINATES	
1	P1	307995.00	565362.00
2	P2	310272.95	577046.61
3	P3	319587.06	575676.05
4	P4	314763.35	562070.82

geographic data to a known coordinate system so it can be viewed, analyzed with other geographic data.

The coordinate used for the geo referencing process is as stated below;

road type, road width, keke points, and names of places with high importance's was collected through social survey by direct interview and observation.

III. RESULTS

GIS has the capacity to do spatial inquiry or examination on a database. This of course makes GIS remarkable from other data frameworks. Spatial hunt and control in this research includes retrieving so as to squeeze out geospatial request through the retrieval, collecting, relating and merging different bits which is been saved in the database to create information to bolster choice creation, ArcGIS 10.1 was utilized for the analysis of spatial data.

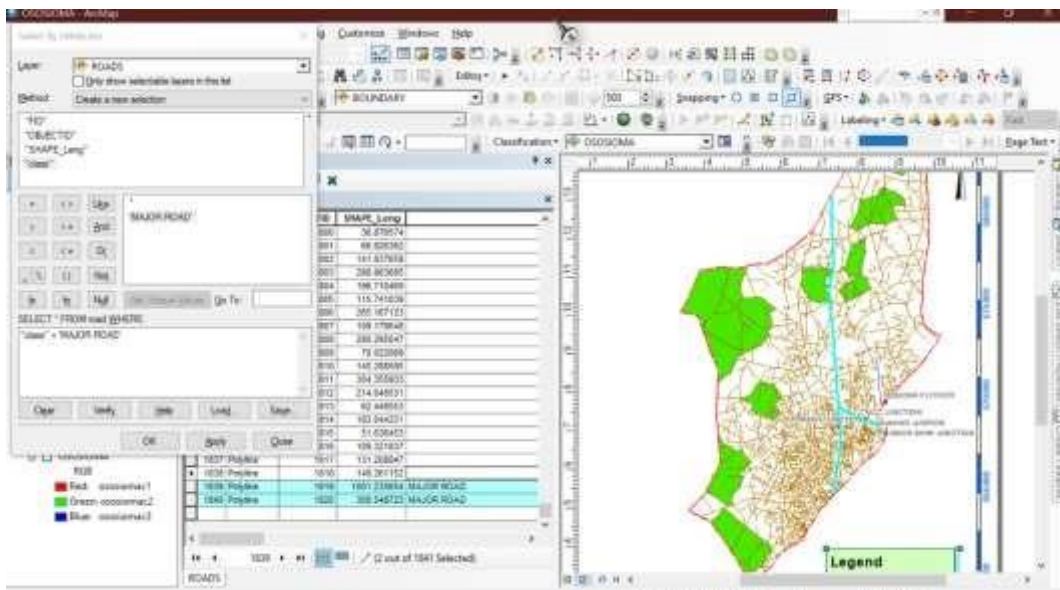


Figure 1.1 Result showing the major roads in Osisioma local Government area of Abia State.

Volume of traffic at AhiaNgwo Junction.

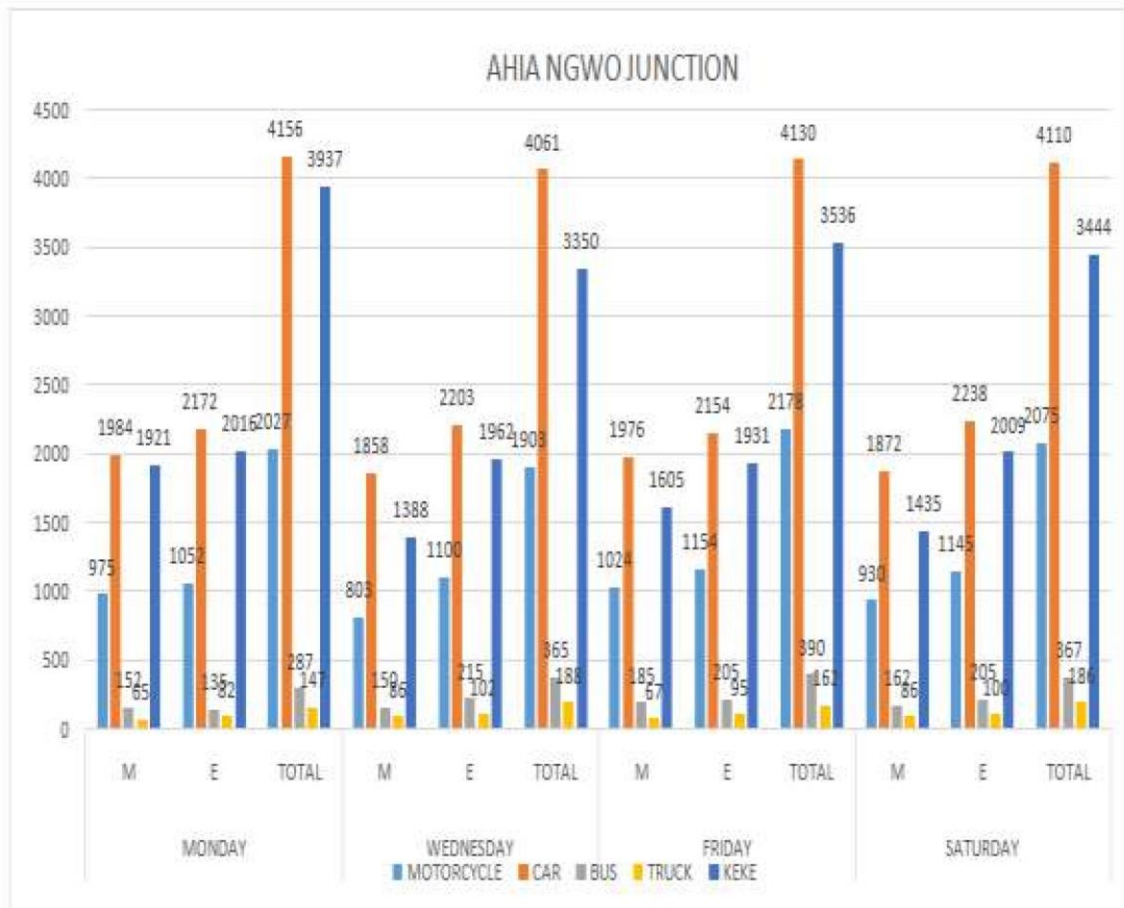


Figure 1.2 Volume of traffic at AhiaNgwo Junction.

2. Volume of traffic at MCC Junction.

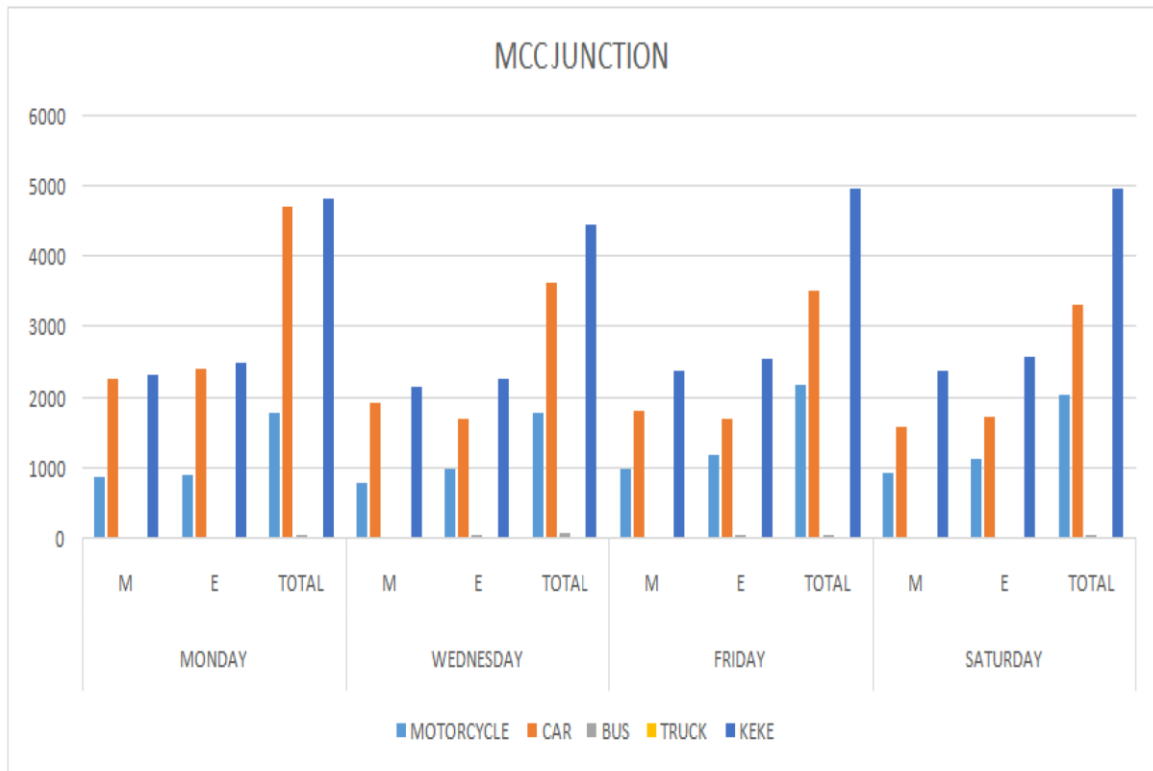


Figure 1.3 Volume of traffic at MCC Junction.

3. Volume of traffic at Osisioma Junction.

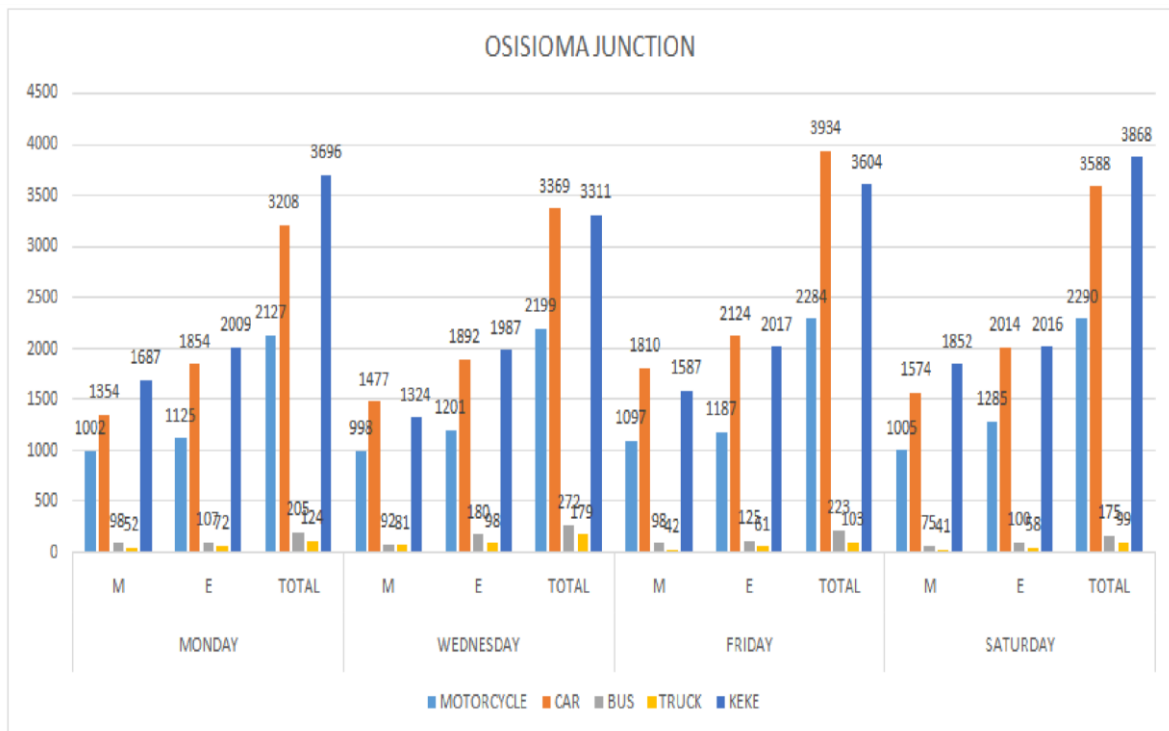


Figure 1.4 Volume of traffic at Osisioma Junction.

4. Volume of traffic At Union Bank Junction.

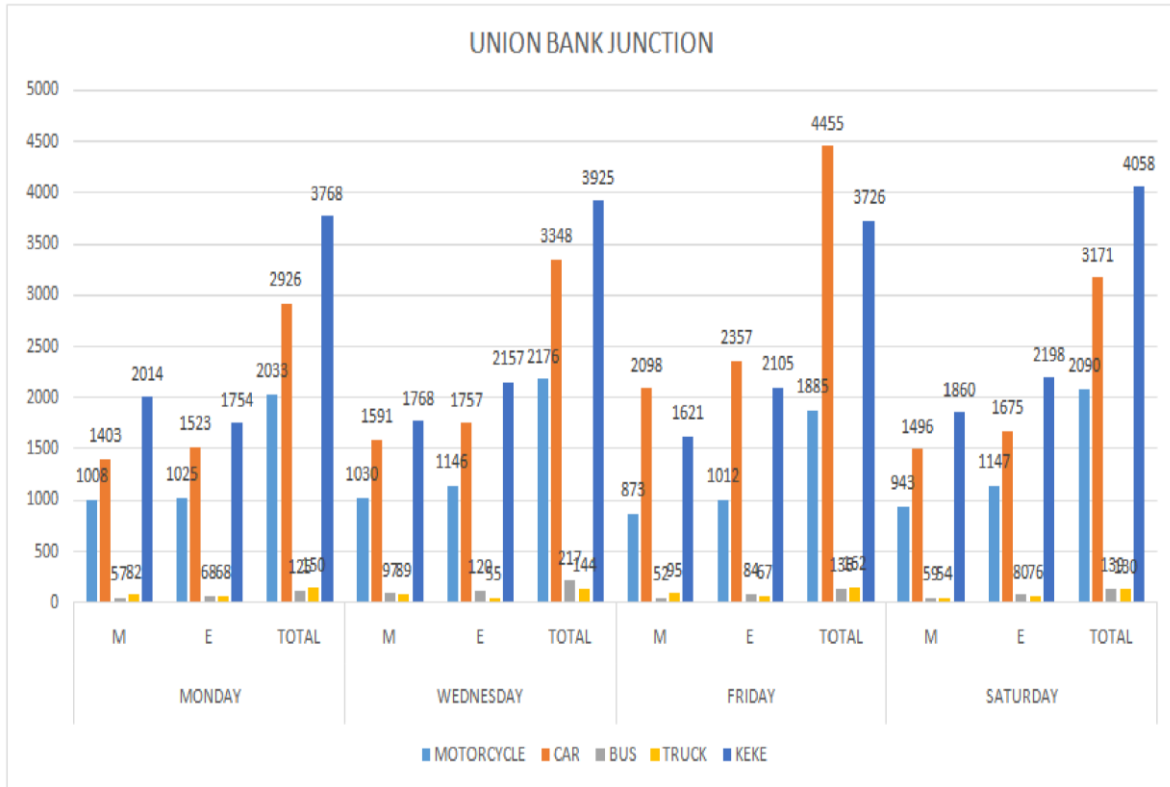


Figure 1.5 Volume of traffic at Union Bank Junction.

As a result of the investigations carried out by social survey on traffic congestion in Osisioma, the result shows that 75% of the respondent were of the opinion that MCC is most affected by traffic congestion, while 37.5% of the respondent were of the opinion that Ahia-Nkwo axis is the most affected and 20% of the respondent were of the opinion that Osisioma junction Area is most affected by traffic congestion.

A further interviewed about what were the likely causes of traffic congestion of MCC area some respondent complained that to many bus stops is one of the major causes of traffic congestion along with other reasons such as over population of car on the road, the road being, too narrow and also perceived bad pavement of the road while in the case of the AhiaNkwoArea the respondents attributed the cause of traffic congestion to reckless driving and because it is the entrance point to commercial cities in Aba couple with the Ariaria market located around the area, this cause a lot of vehicular movement around the area most especially early morning rush to market and evening after close of market.

However the courses of the traffic congestion around Osisiomais because of the uncompleted road networks and also the bridge built does not have a standard direction for entry and Exit, thereby causing rowdiness and traffic on the routes within the flyover and suggest that an indication of road sign of entry and exit be placed accordingly , or alternatively traffic warden be assigned to those spots to direct the motorist.

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