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EVALUATION OF ROAD NETWORK ACCESSIBILITY AND TRAFFIC INDEX: A CASE STUDY OF ONDO STATE

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Abstract: **The aim of this analysis was to analyze the connectivity indices and traffic indices of the Akure road system, Ondo State Nigeria, Twenty-four zones were considered for this study in the main city Akure. Data were obtained from the Ministry of Lands and Google Earth for delineating traffic analysis zones in Akure, then superimposed on the current road system in the research region. This culminated in an improved map of the research area's road network. The revised road map was used to delineate the field of research into traffic control areas focused on main roads. Centroids were found from one field survey of the research area for each delineated region. The revised road map was used to define the field of research into traffic control areas focused on main roads. Centroids were found from one field survey of the research area for each delineated region. Traffic data were gathered at the center of each traffic analysis zone from the highway using the system of manual counting. Data indicated that the percentage of nodes and arcs in the sample area was 4633 and 5372, accordingly, while urban population ranged from 188.2 (SPA Zone) to 21467.6 (IZO Zone) across the TAZ in terms of total area road length (Km2). This indicated that the route density was relatively high in the study area. The gamma index which is the compatibility index calculated in this analysis varied through the zones from 0.31 to 0.48. The average Gamma index was found to be 0.38, which means well linked road network. Traffic indices found that passenger vehicles had the highest traffic composition at 61%, led by Motorcycle 33%, Trucks 2%, Wagon 1%, Vans 1%, Lorries 1%, Buses 1% respectively. At C.A.C Grammer School (OER Zone), traffic density was highest at 320 pcu / km, while volume of traffic was highest at Akure Mall (SPA), with a peak hourly volume of 5090 pcu / hr. The research findings are strongly suggested for government use in formulating transport plans in the study area.**

1. INTRODUCTION

1.1 General

The main objective of the road transport network is to connect local resources and people within cities, countries, and countries. A strong and effective transport network is important for sustaining and enhancing the standard within cities to ensure sustainable growth, providing support for the creation of urban and rural systems. Due to the tremendous growth and expense of the road network, continuous and efficient usage is important, and can only be accomplished if there is proper connectivity. More so, the focus should be put on road transport network structure and design. Development without transportation, which is a crucial factor in physical and economic development Oyesiku, (2002), would seriously restrict the world. It is interdependent on transport networks and land use. Indeed, earlier studies findings indicate convincing and clear linkages among them (Ewing and Cervero, 2001; Polzin, 2004). According to Bailey, et al. , (2008), the transport route is an integral aspect of human life, growth, and society in a distinctive development pattern and road network.

Road networks are measured in terms of the reliability, mobility, traffic density, service quality, compactness, and width of individual routes. Service level is a measure to evaluate the standard of service on transportation equipment or facilities and is a holistic approach which takes into account various factors considered as measuring the density and congestion of traffic rather than the average traveling speed (Mannering, et coll., 2004). Connection to main roads offers competitive opportunities for enterprise users to reap the services. As it is well known that our daily lives depend heavily, in fact, on the transport system. Around the same time, we face the possibility of weak access to the road network. It is therefore highly necessary that the assessment of good road networks, which are effective under the state of road network evaluation, be carried out and that the region maintains connectivity with its central areas while, at the same time, the centroids in the region should be satisfactory and well connected to their road network. Another approach to do this was to establish the idea of research area connectivity evaluation. Lastly, the evaluation of the research area's road network and accessibility would be assessed by taking suggested steps. However, by analyzing the road network the accessibility of the research area can be preserved.

The goal of this analysis is therefore to assess the connectivity of the road network in Akure, Nigeria, to recognize the places where there may be a rise in the number of vehicles using the road (links) and intersections and the deactivation of which could break down the entire network leading to a decrease in the functionality of the route assesses the accessibility of the metropolitan area, namely Akure, located in Nigeria.

1.2 Problem Statement

In pairs of congestion, people expend an enormous amount of time driving from one destination to another between their residence and workplace. Therefore, in this field of research, drivers evaluating this path find it difficult to travel easily in their cars due to heavy traffic and even poor road conditions. Traffic congestion when the transport system of a town cannot handle the amount of traffic which it uses. This condition is exacerbated by excessive motorization development and with less than the accompanying change in the road network, traffic control strategies, and associated transportation facilities. Also, the highway carrying capacity specifies the cumulative number of vehicles that can travel in one direction over a given portion of a lane or street, or both for a two-lane highway, over a specified time. And as the amount of traffic increases, the speed of each vehicle is determined by the speed of the slower vehicles to a considerable degree. Consequently, as traffic velocity rises, a point has been reached in which all vehicles can travel at the higher driving level. If achieved, this state means that the maximum potential has been exhausted, resulting in traffic congestion. The importance of this analysis is to test the study area road network accessibility index and congestion index if the roads are well connected to other roads to enable commuters to achieve optimum comfort without delay in moving from one destination to another within the study region once it has been evaluated.

1.3 Aim and Objectives of the Study

This research is designed to determine Akure road network connectivity.

The research's primary objectives are to:

A. Determine the traffic management clusters zones.

B. To determine the connection and traffic index of the separate traffic monitoring zones in Akure.

C. Evaluate the distributions over the study location of the variables in (b) above.

1.4 Justification and Scope

This investigate was done to survey the network lists and activity records of the Akure street organize, to know in case the streets are well in a few particular clusters beside twenty-four (24) distinctive areas inside are well associated and to evaluate the number vehicles of commuters that utilized these clusters are much or few, a few zones of the street beneath consider are underused whereas a few are abused but as this streets will be surveyed afterward will tell after the appraisal of the broad areas that are underused and areas that are abused to supply more foundation and to form an extension to the streets for the simple and helpful for the commuters that evaluate these clusters.

1.5 Description of the study area

Akure is a city situated in the south-western Ondo state of Nigeria, with a total land area mass of 991. The city is situated about 7 ° 25 'North of the equator and 5 ° 19' East of the meridian located in Nigeria's tropical rainforest region. On 3 February 1976, Akure was declared the state capital of Ondo by the military government, which gradually led to the formation of several ministries and legislative firms. When the state eventually took off in April 1976, it was followed by a rise in the number of immigrants which contributed to an unexpected rise in the population of the city. This growth, at the same time, resulted in increased demand for housing and transportation infrastructure. As of the 1991 census report carried out within this province, Akure province had a total human population of (253,365) and a residential unit density of (62,326). The population of Akure city rose by a proportion (39.41 percent) of some (353,211) residents and a housing density of (86,888) as opposed to the 2006 census report.

2. LITERATURE REVIEW

2.1 Review of Related Studies

In 1982, Mine and Kawai first proposed connectivity which represents the possibility of retaining connectivity between nodes in transportation networks. According to Asakura (1996), the idea of travel time reliability, which is another way of calculating network efficiency, takes a direct account of the transportation needs of both the road network and traveler behavior. Nicholson and Du (1998) specified the recession reliability of the traffic flow, namely the possibility of pair decline or traffic flow in the network not reaching a certain amount, and pointed out that one or more pairs of the road network would be directly affected when a recession occurs in one segment of the route. Lam and Zhang, (2000) presented the idea of requiring reliability of satisfaction, representing the capacity to meet future travel demand for the road system, and defining the possibility of travel demand fulfillment rate not less than a given amount. Bell and Schmoker (2002) extended the efficiency of travel time to the efficiency of travel costs, including travel time, the distance of travel, car charges, and public transit costs; if the cost of completing a journey is less than a specified threshold value, the subsequent road segment is called reliable. In China, based on the designed to simulate a tree's development principles, Zhu et al. (2003) introduced the channel generation method, in which all channels are productive and appropriate for large-scale networks, addressed the successful channels, responsiveness in road parts, and efficiency; for the traffic congestion network's frailty factors, Jin (2004) investigated the efficiency of u evaluation framework Under Lin et al. (2005). Researched the efficiency of transportation systems in emergency and highlighted the three risk concerns typically seen in emergencies: loss of nodes and section resources, repair features of node and segments, and durability of communications in emergencies Technical Problems in Infrastructure 3. However according to Fan et al. (2005) provided the measurement indices of network performance and the measurement model of reliability based on the network configuration and calculated the network structure's arc, direction, node, and calculations; According to Yuan et al. (2008) found the condition of the instability of the transportation system under reasonable traffic constraints and suggested a shift in the decision from unpredictable to probabilistic network topology and a choice of route model estimated travel time reliability. Through the review of the literature, it can be seen that the research of the efficiency of the road system has changed the study from the physical structure of the road system to that of the assessment of the flow of loaded traffic and the reciprocal impact between the demand for travel and the capability of the road system, as well as the actions of motorists; Connectivity reliability and travel time reliability are the related reliability indices. During this time, some scholars suggested that the demand should be fulfilled with reliability, weak point reliability, value index efficiency, and dependability. In China, the study is done based on international studies and complements or continues the findings of different researches; there is no major advancement in road system reliability indices, and much of the study is on communication efficiency and transit time consistency. However, domestic research has investigated connectivity dependability and transit time efficiency from a range of opinions and conditions that broaden the thinking and provide a basis for further research in this location. Also, some philosophers have researched the potential of the road system dependability.

2.2 GIS Road Strategy

The information system (GIS) is increasingly being used in transport planning organizations, especially among urban transportation organizations. Maintenance of highways is now a serious concern in many developing countries. Owing to declining costs and GIS rising over friendliness, even more, authorities are now able to use GIS for Highways and Transportation management. GIS provides urban planners with a tool for acquiring and accessing population density data, land uses, travel activity, etc. Mapping/display and data convergence are the two relevant priorities for using GIS. Agencies need to identify potential issues that can be tackled more efficiently and effectively through a GIS application, and more economically than with prevailing methods. GIS information is used by federal, state, and local agencies to develop and plan transportation policies (Gupta et al . 2003).

There's the widespread use of GIS for transportation applications. Common applications include road maintenance, traffic modeling, accident investigation and traffic management, as well as road system environmental impact assessment. A structured transportation system is a fundamental component of most GIS transports. Additional details regarding general topography, land cover, and land use is relevant to the consideration of the construction impact. Lack of adequate GIS data remains a persistent issue. GIS describes a world consisting of a leadership system of graphical objects in terms of longitudes and latitudes, and other projection systems. The standard GIS depicts a map of the globe. The key GIS management infrastructure needs and concerns include creating and managing a database, choosing and updating hardware and applications, using technology to address challenges, banking, networking, supplying connectivity, among others. Normal GIS features include thematic visualization, charts, charting, manipulation of matrixes, decision support framework, simulation and algorithms, and access to several databases at the same time.

2.3 Road connectivity Evaluation

Road access is accomplished by providing links to the arterial highway network within individual projects, within projects and by creating a well-planned road collector network to complement. The connectivity of a region can be calculated utilizing a connectivity index-generally defined as the connection to node ratio. A successful infrastructure of road transport is a requirement for sustainable economic growth. Not only is it the main infrastructure development input for the development process, but it also plays a major role in fostering national integration, which is highly pertinent in Akure. The transportation system also plays a significant role in fostering the growth and inclusion of backward regions with the global economy by opening them up to trade and investment. In a liberalization set-up, an effective transport network becomes ever more important to increase competitiveness and boost the competitive performance of the economy on the world market of the different modes of transport that connect the country's cities and villages, road transport is the key connection. Road connectivity promotes human and resource transport supports commerce and exchange, connects manufacturing and agriculture to markets, and expands backward parts of India. Furthermore, the transport network thus offers a last-mile link for other modes of transportation such as highways, airports, ports, and inland waterway transport and enhances the efforts of these modes to fulfill the transport needs.

2.3.1 Indices of road connectivity

Connectivity measures assess the intensity of the connections between the road segments, connectivity refers to the directions of travel between the different destinations. A well-connected and very well-connected transportation system has several short links, various intersections, and low minimum dead ends which provide a consistent, efficient route to several locations. Different sorts of network lists are created within the past, a few lists utilized for assessing the network design of the street organize are Alpha Record, Beta List, Gamma Record, and Network Tree Design File (Noda, 1996), (Shen, 1997) endeavored to investigate the spatial variation of the street organize the structure of West Bengal with the assistance of chart network measures in conjunction with street thickness, agreeing to (Nagne et al. 2012), (Noda, 1996), are a few other Indian considers which connected GIS innovation for the evaluation of transportation organize utilizing connectivity indices. The network of a street organize is characterized as the degree of association between all hubs within the arrange. The level of comprehensiveness of the connections between nodes is often referred to as this. The effectiveness of the road system is measured by the degree of connectivity, i.e. the greater the level of connectivity, the greater the performance of the road system. Such metrics are used to calculate the degree of reliability of the transport system. These criteria are thus clarified, and how they'll be calculated in this research:

A) Beta (β) Index of

For both TAZs and the research area as a whole, the Beta index will be calculated using ArcGIS's network analysis tool in combination with MS Excel. A beta index is a metric of redundancy which is an estimate of the size of nodes and edges in a system, which can be calculated by calculating the total number of nodes in a system by the number of nodes in general. The Beta index is determined using Equation below.

β = to E V

There, β = Beta;

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E = Edges number; and,

V = Edge

Where β is index beta

The number of edges is e.

V reflects the number of vertices/nodes

β The values will still be less than 1 for isolated or badly wired networks. If there are no edges in the network, it will require zero values whereas values greater than 1 denote a well-connected network.

B) Index gamma (g);

The ratio of the number of edges detected (e) to the mean number of edges is g. It calculates network capacity in terms of the full number of potential road segments that can still be accommodated in the network. In the Equation below, it is shown mathematically.

$$\text{Index Gamma } (y) = \frac{E \text{ x } 100}{3\ (T\text{-}2\ G)}$$

Where e is edge count

3(v-2) contains a maximum number of edges

G cycles 0 to 1. The greater the index, the vastly higher will be the degree of network connectivity.

C) Factor-alpha (α)

A is a valuable indicator of complicated network connectivity. It's dependent on the number of circuits inside the network that can be created. The number of circuits shows the number of alternate routes inside the network that can be created. The alpha index (α) is calculated as shown below in Equation.

$$\text{Index alpha } (\alpha) = \frac{(E - V + G) \text{ x } 100}{(2V\text{-}5\ G)}$$

Where e-v+1 represents the actual number of existing network circuits

2v-5 is the highest number of networked circuits available

The alpha value varies between 0 and 1. The higher the score, the bigger the degree of network access.

2.3.2 Statements

Coverage metrics define the density elements of a network function as intersections and connections, the measurement of coverage is very essential and has a lot of utility in assessing compressibility and growth. As the value goes higher, more network is created, network density and intersections density are the attributes of the road network within a city. (Shen, 1997) attempted to investigate the current road network trends

2.4 Methods for determining road accessibility

The graph theory is important for research of two or more locations on mobility and connectivity. Line patterns exist in graph theory, which is referred to as a network described as a collection of geographic locations interconnected by a system. The number of routes thereby rendering it very difficult to use a quantitative method to provide a precise definition of transport and land use planning, and it is similarly difficult to assess quantitatively the mobility and proximity of two points to all other points. Also, the qualitative definition is often inadequate to compare the features of one network with another, although it is also inefficient in evaluating the current and potential patterns of elements in the road network. Centered among other items on these shortcomings, the graph qualitative approach arose as an alternative to the quantitative method in accurately capturing all facets of the networks. A variety of methods have been introduced in evaluating the degree of usability, one of which is the chart-theoretic techniques. In the study of a community's growth rate, the hypothesis has been applied widely at the regional and local level with consequences for estate assessment, urban construction, and planning, and can be generalized to a larger and more comprehensive analysis of road network correlation. The graph-theoretical method relates to this research as it assists in the review of the study area's road network structure giving a better understanding of the separate inter-nodal points for each of the routes within the study area, which otherwise cannot be accomplished by quantitative research method. It also allows for a direct distinction to be made between the nodes and validated the theory's potential to make an empirical comparison between multiple networks, thereby integrating into statistical analysis concerning the detection of changes that may have arisen in a network's spatial structure.

2.5 The description and comparative assessments of road networks

Classification of the road network is addressed according to the grading and in some of which the classification of roads should follow when developing a successful road network structure. Road identification and hegemony are dominant factors in the design of the road network and the road hierarchy is a basic system of road classification in which each category has a graded role concerning the entire range of categories (Marshall, 2005). Road classification has to do with the practical efficiency of traffic flow, protection, accessibility, and environmental standards in urban areas and roads can be graded according to the type by which a path will change along its length if a change in any physical property occurs. Such parameters such as "trip length," population size, traffic volume, and others dependent on improvements in the road network itself can also be dependent on the classification. These criteria, due to the change in the road system, are more stable over time than other types of road categorization. They are classified by the function of the network and changed when the network changes. In this case, the classification of the different sections of the road refers to its relationship with the rest of the network, and the choice of strategic routes will be informed by factors which show all the strategic routes connecting in a particular way based on a specific structural property known as "arterial." Arterial is a form of strategic contiguity by which all the "top-tier" elements contiguously unite, implying that each route connects either to the same or higher-level route. The course arrange design is analyzed employing a variety of procedures, which incorporate urban morphology Moudon, et al (1997), fractal investigation, cellular automata Wacko (1997), activity design examinations Taylor (2000), Typology is a course of action and network of hubs and joins of a arrange long-standing intrigued in measuring the spatial structure of street systems driven by the inborn effect of organizing structure on the execution of transportation frameworks with consequent impacts on arriving utilize and urban shape Xie and Levinson, (2006) network. In expansion to concepts of network, space sentence structure makes utilize of the concept of depth, which could be a degree of organizing 'distance' – steps of contiguousness – between arranging components. The profundity of any hub line may be more related to the coherence of streets and ways as courses, than on their inter-visibility over space. This, agreeing to Wacko (1999), has opened up the address of what could be the foremost fitting basic units for speaking to the "active ingredients" of development structure. A transport organization can be considered as a topologic chart with three parameters from which quantitative estimations may be computed as a premise for objective depiction, comparison, and evaluation of the organization. The parameters incorporate a few partitioned non-connecting sub-graphs within the arrange spoken to by G, the number of joins (or edges) within the organize (E), and the number of hubs (or vertices) within the organize (V). A few topological approaches of street organize structure degree the network of a street arranges. There are four such measures, to be specific, Beta List, Chromatic Number, Alpha File, and Gamma Record. Marshall (2005) has claimed that the study of the route structure is based on three simple route-properties, namely consistency, connectivity, and depth. Continuity is the number of connections that the path is made up of or the length of the path represented in connections, representing the number of junctions that the road is continuous across. Connectivity refers to the number of routes the road connects to and represents both the number and the modality of the joints along the road. Distance calculates how far a path is from a given "datum" measured in the number of steps of adjacency, the more steps away the path is from the location, the "deeper" it is, and the fewer steps away from the "deeper." The analysis of the path shall be viewed in terms of relative continuity, reliability, and depth referred to as the study of reliability. Consistency and complexity have to do with connectivity: consistency has to do with the internal connectivity of the connections that form each path, while complexity has to do with the relative connectivity of the path in the network. Various accessibility initiatives also reflect different strategies for functionality.

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3. METHODOLOGY

3.1 Categorization of the Traffic Monitoring Field

In qualitative research uses Akure as a case study to delineate the fields of traffic analysis. The research area was divided into 24 traffic analysis zones based on the main road networks present in the region. Using the focusing method, he determined the covariance matrix of each of the areas in question (giving a particular Taz midpoint) and created a thematic map showing the Taz shaped within the study area. Oh, Okoko, (2006). The system and network provided by Okoko are shown below in Figure 3.1.

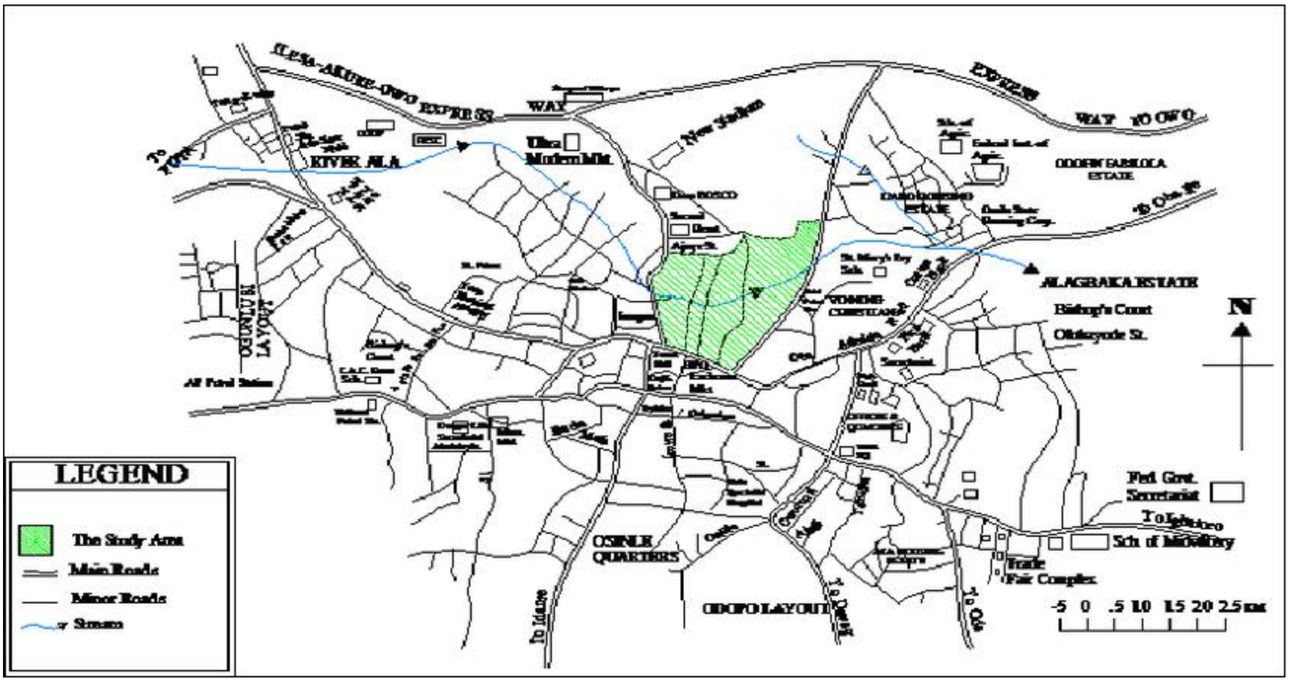

Fig 3.1 Map displaying traffic monitoring areas within the city of Akure.

The TAZ map created by Okoko, among other secondary data collected, is used as the basis for the description and allocation of traffic analysis zones within the Akure Region. Figure 4.1 indicates Akure (Study Area) which was clustered within the city based on the existing regional road network. The findings given by (Okoko 2006) were used as a key reference for traffic analysis areas but were changed and revised with the road network data obtained by the Ministry of Land, Akure Nigeria, on 16 May 2018. The data obtained from the road system included new main roads and land features due to the development that had arisen in the research region years since its investigation (Okoko 2006). Based on the updated road networks, the traffic analysis zones are identified as boundaries utilizing roads and river paths within the study area. Reference to historical study.

3.1.1 Assessment of the traffic analysis of the centroid region

The centroid zone is defined as a "hypothetic point in a traffic zone from which all travels are to start and from which trips from all other traffic areas of the city are to end." Every centroid zone must be a point with a peak and a predominant concentration of activity. Using land maps and field surveys, a thorough analysis of the region within the Centroid district zone was defined as having the highest attraction (due to the presence of certain facilities, i.e. banking, entertainment, etc.) of commuters. Okoko (2006) defined their centroids for all traffic analysis zones generated within and situated within the study area.

3.2 Data collection

Road Data Collection The checking of data is carried out several times by performing manual traffic counts at the specific location of the traffic survey of and centroid where the data is collected.

3.2.1 Types of Data Collection

(a) Details on the road system using GIS

The road network analysis was carried out using the extension of the ArcGIS Network Analyst. ArcGIS is a versatile extension that offers network-based spatial information, including path analysis, travel instructions, near facility analysis, and Amrapali et al (2015) service area analysis. It allows users to automatically simulate specific road network variables such as lane controls, speed limits, and traffic patterns at various times of the day. The ArcGIS Network Analyst Extension uses the traditional Dijkstra algorithm to measure the least cumulative cost between the destination network and every other node on the network. Two forms of network analysis were used; the best path analysis and the closet service analysis.

(b) Traffic Statistics Usage Traffic Count

The traffic count system used in this analysis is the manual counts reported on the count sheet, through physical inspection, through counting the number of vehicles measuring the chosen centroids, which were counted and recorded accordingly and, in turn, documented our volume specifications on the summary page. The data was gathered at about 24 locations (traffic centroids) in Akure in the morning, afternoon, and evening for one hour, per morning, afternoon and evening, the count sheet consists of the following.

After that, they can translate to their PCU coefficient and redistribute it for use. The table below Node Degree, i.e. (a node with two arcs attached to it, has as 2).

Table 3.1: Passenger Car Equivalent Category

Type of vehicle	Equivalent passenger vehicle Unit
Pedal Cycle, Tricycles, Engine Cycles Motor-car, Wagon stop, taxi, set	0.5
Bus or automobile, Pick up, Jeep, Land Rover, Compact Delivery Truck, Minibus.	1
Trailer linked to the following article	2
2-Class Axle Truck, Lorry with Timber	2
Lorry, Tractor, Cart, Fuel Tank. Trailer linked to the following article 3 to 5 Axle Range, Tractor Trailer with Low Loader, Fuel Tank, Bus (excluding Municipal)	3
Municipal Coach, More than 5 Axles Mix	4

Source: (Cadiayali 1995)

3.3 Data analysis

Using ArcGIS 10.3 and Microsoft Excel programs, data collected from field surveys, findings, and imagery will be analyzed. Analyzing can be performed to evaluate the following road network parameters.

3.3.1 Road traffic indices

Connectivity in the research area's road network has been checked using the Gamma Connectivity Index and to use this, it is important first to calculate the total number of nodes in the road network and the straight lines between the nodes collected manually by counting from the master road network.

Gamma Index (y) calculates the average of the number of connections found in each network, and the actual number of links. This varies from zero (0) indicating no connections to one (1) meaning that each intermediate node has a relation to each other node, which is calculated as. Gamma Index (y) =

$$\frac{E \times 100}{3\,(V-2G)}$$

3.3.2 Traffic indices

(A) Area of traffic

The composition of traffic is specified as the percentage of heavy vehicles concerning the number of cars, the composition of traffic is calculated by measurements of vehicles on roads with date and time interval for determining traffic composition.

(B) Traffic capacity

The amount of traffic can be referred to as the number of vehicles traversing a stretch of road per unit time at any given time. Studies on the level of traffic are undertaken to gather statistics on the number of cars or pedestrians reaching a point on a highway over a given time. Studies on traffic volume are typically performed when such volume characteristics are needed, some of which follow:

1. Average Daily Traffic (ADT)
2. Regular Daily Traffic (RDT)
3. Duration of Peak Hours (DPH)
4. Graded vehicles (GV)
5. Miles of Travel by Car (MTC)

The volume of traffic can be calculated using the Annual Average Daily Traffic (AADT), a metric used mainly in transport planning, road infrastructure, and retail location selection. Under the basic annual average daily traffic rule, AADT is calculated as the total amount of traffic entering a point (or segment) of a road in both directions for a year separated by the number of days in a year, including actual volumes within a month on at least one day of a week.

(C) Traffic density

Traffic density is the number of automobiles in a traffic lane that occupy a given length of a road or highway. The density of traffic is expressed as vehicle/mile, or vehicle/km. The traffic density is taken in images of 50 meters in length from one point to the other at a moment to obtain the road traffic of the centroid territories.

4. CONCLUSION

In this report, the reliability of the Traffic analysis region is visible in terms of access to the road system. The methodology was used to determine the evaluation of the road network in certain parts of Akure in terms of the route, route form and accessibility status present. Results indicated that the percentage of nodes and arcs in the work area was 4633 nodes and 5372 arcs respectively, while the average road length and area road width was 75,68 km2 in the TAZ, indicating that the average road density was high in the research area. The gamma index, the connectivity index calculated in this analysis, ranged from 0.31 (IES) Oke Ijebu Junction which is the lowest gamma index of all zones to 0.48 (OSH) Sunday Bustop, (AIS) Isolo Market, (FSG) South Gate which occurs as the areas with the high gamma index from across zones. The average Gamma index has been found to be 0.38, meaning the road is a very well-connected network. The average Gamma index has been found to be 0.38, meaning the road is a very well-connected network. Traffic indices found that passenger vehicles had the heavy traffic proportion at 61%, led by Motorcycle 33%, Trucks 2%, Wagon 1%, Vans 1%, Lorries 1%, Buses 1% respectively. Traffic density was the highest at C.A.C Grammer School (OER Zone) and has the lowest traffic density at Oba-Ile (OIL Zone) at 80 pcs / km, traffic volume was the highest at Akure Mall (SPA) with the highest total hourly peak at 5090 pcs / hr and the lowest hourly peak at 524 pc / hr in Low-Cost Housing Estate (SVI). Lastly, the Gamma index for all zones is less than one from the Gamma index results that all roads are well connected to the road network. Therefore, it can be concluded that the study area's road network is in excellent state and the level of connectivity is high from road density. Most regions are less structural and the socio-economic development is poor.

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