SPATIAL ANALYSIS OF ROAD NETWORK AND TRAFFIC CONGESTION IN ZARIA, KADUNA STATE, NIGERIA

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ABSTRACT

The purpose of the study was to assess the spatial distribution of road network and traffic congestion in Zaria. The study focuses on the road transportation system in Zaria Metropolis of Kaduna State, Nigeria. The objective of the study was to examine the various factors contributing to overall traffic congestion, assess the spatial distribution of the road network and determine the traffic hotspots area. Zaria was chosen for the research due to its strategic location as a transit point which connect North, South, Central and Western parts of Nigeria, which makes it prone to traffic congestion. Different methods were used to generate data based on the objectives. A household survey was undertaken using questionnaires, interviews, observation and reports on the randomly selected respondents to collect data on traffic congestion. While hotspot analysis was carried out in a GIS environment using GPS coordinates collected from the field based on the vehicle and traffic flow characteristics/parameters. The simple index framework was also used to analyze the level of accessibility and road network connectivity using the Alpha, Beta and Gamma index. The results of the findings showed that various factors were responsible for traffic congestion in Zaria, among the top four factors included; poor road network (92%), passengers/ goods pick up and dropping (87%) and poor traffic coordinates (72%) illegal parking (70%). Certain types of vehicles are also discovered to be among the contributing factors, the top three are; Town service buses (51%), Tricycle (27%) and Goods vehicle (13%).. The Alpha index showed that the road network in Zaria was 0.07 or 7% maximally connected. This also is an indication of low level of economic development. The road network connectivity using the Beta index is 1.16 and the Gamma connectivity index was 0.40 or 40% which was an indication of low level of road network development in the area. The findings also showed that the hotspots were heavily congested (48.2%), moderately congested (39.6%) and slightly congested (12.1%). The synchronized flow (52.7 %) was the most common type of traffic experienced, followed by Moving Jam (41.9%) and Free Flow (5.4%). From all the Hotspots identified a 90% confidence interval and statistical significance were achieved between the identified hotspots and cold spots. The commuting time varied between the public and private pickup times. The implications of this study indicated that mobility in Zaria Metropolis is restricted due to congestion, causing excessive travel delays, particularly, during peak hours and negatively affecting productivity due to certain factors, poor traffic coordination, illegal parking, passenger picking/dropping, goods pick up and uploading and poor road network are among the top factors. Therefore, expanding transport infrastructure as well as improvement in the traffic management and control system should be given attention to improve the transportation system in the metropolis.