THE USE OF REMOTE SENSING AND GIS IN MAPPING TRANSPORTATION NETWORK IN LOKOJA, KOGI STATE.

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ABSTRACT

This study focused on creating an up-to-date spatial database of Road Network in Lokoja Kogi State using Remote Sensing and Geographic Information System (GIS) approach. The GIS and remote sensing capability of displaying graphics, while linking features to attribute tables has become a valuable tool for maintaining and updating roadway network files. This study will help travellers and commuters on their choice of route. A satellite imagery covering the study area was acquired to serve a base map, layers were created in ArcCatalogue of ArcGIS 9.3 software. The imagery was georeferenced and thereafter digitized in ArcMap of ArcGIS 9.3 software. An up-to-date spatial database of Road Network in Lokoja with the soft and hard copy map of Lokoja showing the road network were created at the end of the study. The transportation pattern in some selected major roads was also studied. It is observed that some of the major roads are not sufficiently linked to other roads hence the resultant traffic congestion. It is therefore recommended that more links be provided on some major roads to ease traffic flow around the area.

Keywords: ArcGIS 9.3, Map, GPS, GIS, Roads, Kogi State.

1.0 INTRODUCTION

A road is a thoroughfare route, or way on land between two places, which has been paved or otherwise improved to allow travel by some conveyance, including a horse, cart or motor vehicle. Road network is therefore, a collection of all roads in a given area. The urban road network plays a key role in the urban spatial structure. It is the main city social-economy activities and transportation carrier. There is therefore, a widely accepted link between economic well-being and good transportation network. One of the most important problems is how to evaluate the accessibility of road network (Weiping, 2010). Keeping traffic moving is one of the biggest challenges that all levels of government are facing worldwide. Travellers, motorcyclists, commuters, and the public sector are continually searching for new and faster travel routes. In cases of emergency such as in road accident were an accident victim might be needed to be rushed to the nearest hospital, a good knowledge of possible shorter route will be useful. To ensure that all these problems are adequately solved, quality and dynamics data are needed in our route section (Nnah, 2014).

A map is defined as a representation on a plane surface of the physical features, both natural and artificial, of some parts or whole of the earth's surface at a given scale, by the use of signs and symbols with the method of orientation indicated. It is a means of conveying geographic information. Maps are universal medium for communication, easily understood and appreciated by most people regardless of language or culture (Sule, Shebe, Bichi, & Atiyong, 2011).

A GIS (Geographic Information System) is an automated information system for capturing, storing, analysing, displaying and managing data and associated attributes that are spatially referenced to the earth. GIS is a tool that allows users to create interactive queries (user created searches), analyse the spatial information, edit data, maps, and present results of all these operations (USDA, 2008). Remote sensing is the science of obtaining information about objects, phenomenon or areas from a distance, typically from aircraft or satellites without making physical contact with the object.

Remote Sensing data obtained from multi-spectral scanners are digital representation of

spatial data which can be incorporated into an operational GIS. The integration of GIS and remote sensing methods is widely recognized as mutually beneficial since both technologies are used in similar applications by similar professionals (Ndukwe, 1997). GIS and remote sensing provides a systematic approach to analysis and answer social, physical, and economic problems associated with urban transportation (Nnah, 2014). The use of a GIS database provides a stored 'intelligent' record of the derived observations and accurately depicting their spatial location on a map. It also provides a means for proper planning and management of road network in order to help identify areas of closed or poor network in terms of inter-connectivity, accessibility and curves to help identify areas that require construction of more road network. It also eliminates the need for physical storage of hard-copy survey records and improves the efficiency and effectiveness of the survey thereby improving access to electronic survey records for use by land surveyors and enable automation in the update and improvement of the survey records (NOAA, 1984). The GIS capability of displaying graphics, while linking features to attribute tables has become a valuable tool for maintaining and updating roadway network files. Displaying the road network on a computer monitor is a very effective and efficient tool in observing the relationship between the spatial and physical attributes of roadway facilities (Alterkawi, 2001).

The aim of this study is to create an up-to-date spatial database of Road Network in Lokoja Kogi State using Remote Sensing and GIS approach. The followings are the objectives: to create an up-to-date spatial database of Road Network in Lokoja from remotely sensed data, to study the transportation pattern in some selected major roads and to produce soft and hard copy map of Lokoja, showing the road network.

1.1 Study Area

Lokoja was the first capital of the British Northern Nigeria and at present, it is the capital of Kogi State. It is situated in the middle belt of Nigeria in the confluence of the Niger and Benue rivers. It has an area of 3180 km² and a population of 195,261 at the 2006 census. It lies between Longitude 6º 43' 19.8"E 6º 45' 13.8"E and Latitude 7º 47' 12.6"N 7º 49' 6.6"N (Google maps, 2018). Lokoja is a typical example of a linear settlement being bounded the famous Mount-patty in the west and the river Niger in the east.

2.0 MATERIALS AND METHODOLOGY

2.1 Data Acquisition and Processing

The satellite imagery (Google Earth 2018) of the study area was acquired from the web. A Handheld Global positioning System (GPS) receiver (Garmin 76) was used to acquire coordinates of six well-defined points (at suitable positions) for the purpose of georeferencing, as well as the coordinates of the position of administrative structures like offices, school, banks etc. Most of the tasks carried out were done on a Computer with ArcGIS 9.3 software installed on it. The satellite imagery was imported into the ArcGIS environment from where different layers were created using the ArcCatalog, the imagery was georeferenced and thereafter digitised using the ArcMap of ArcGIS software. The coordinates of the position of the administrative structures (such as banks, schools offices, etc.) were typed in Microsoft Excel and later imported into the ArcMap and ploted. Ground-truthing was carried out for verification of some features that were in doubt, to assess the accuracy of what was already done and to study of the pattern and flow traffic. The database was created using the ArcGIS and the map was produced after various cartographic editing were done. Different queries were carried out.

3.0 RESULTS AND ANALYSIS

The transportation pattern in some selected major roads was studied. It is observed that due to the type of settlement in Lokoja metropolis (being linear settlement), as fashion by the bounding of mount Party and river Niger on either side, the major roads assumes such linear pattern. Hence, there is need for more road diversions to ease traffic around Ganaja junction. An up-to-date spatial database of Road Network in Lokoja showing the road network was created. Figure 1, shows the road network in Lokoja.

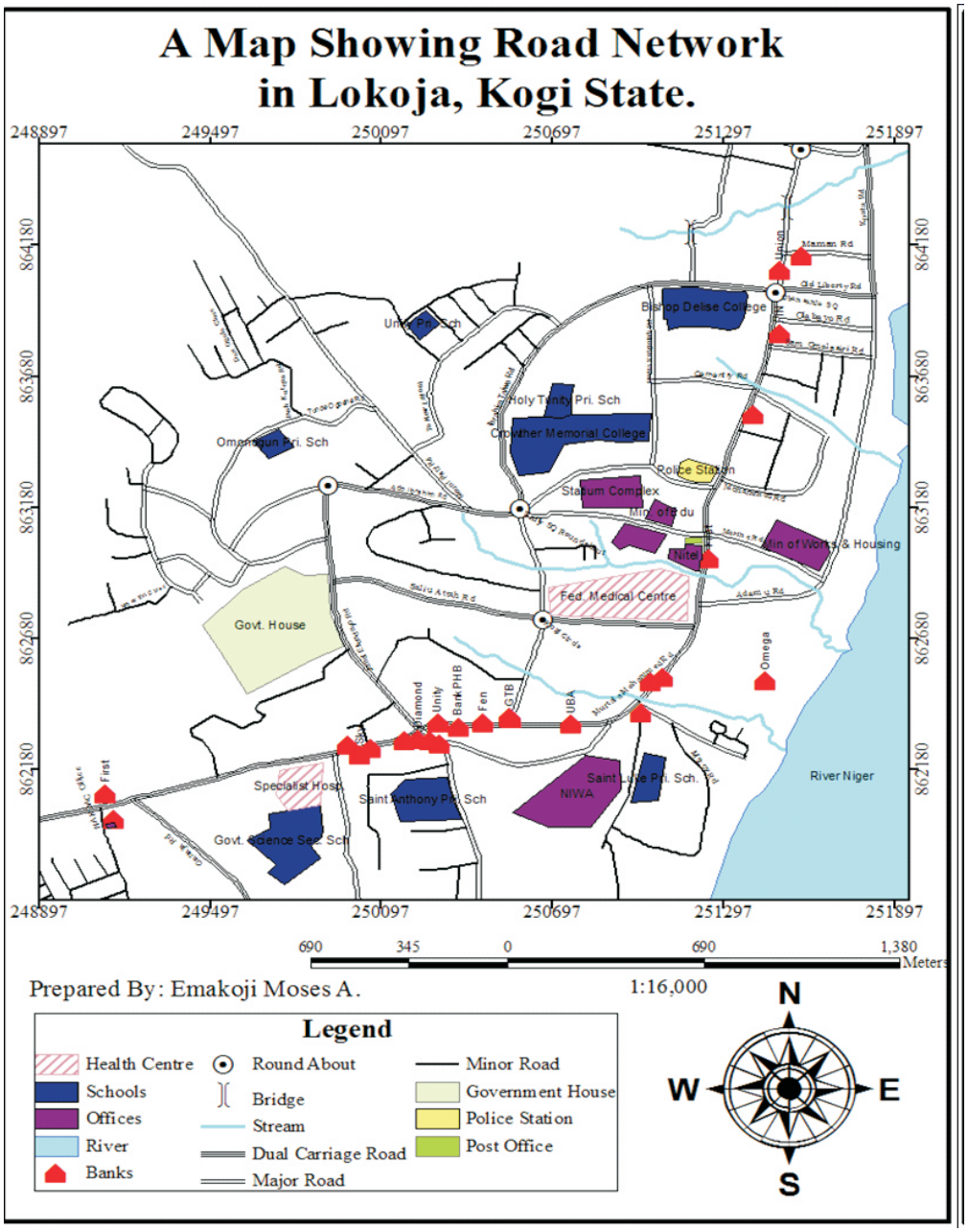

Figure 1: A map showing Road network in Lokoja, Kogi State

4.0 CONCLUSION AND RECOMMENDATIONS

This work has been able to spatially display the road network in Lokoja metropolis. From the map produced, possible area needing more road linkage can easily be planned for. The study will also, no doubt, help travellers and commuters in their choice of route. This study has demonstrated the effectiveness of GIS as a valuable tool in managing spatial information.

Further research should be carried out to analyse the state of traffic congestion currently experienced around Ganaja junction in the usual hours of 7am to 9am and in the closing hours of the day with a view to providing solution to the problem.

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