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Abstract:
Financial Institutions in Nigeria are established for the purpose of rendering public and social services to the public. The cashless financial policy briefly introduced by the Federal Government of Nigeria through the Central Bank exposed some flaws of Financial Institutions from discharging her responsibilities with hundreds of customers left displeased and frustrated. The demand for effective and stress free banking services by populace prompted the need for this study which is aimed to examine the geospatial distribution of Financial Institutions in the study area. The study utilizes geospatial technique which involves direct field observation with Germin 76sc GNSS receiver to obtain spatial information of Financial Institution locations in the study area. The observed data were charted in Open Street Map (OSM) of 2022 and were identified as point feature. Arc-GIS 10.1 vector based GIS software was used for processing and map production. The results revealed that commercial banks were not spread across the study area. A total number of One Hundred and Twenty Three (123) Financial Institutions were identified, this cuts across densely urbanized areas, such as Rumuokoro, Diobu, Government Reserved Area, Rumuokwuta and Town axis with very few located in Trans-Amadi axis amongst others. Clustered, linear and random distribution of Financial Institutions were also noted as no Bank was found in highly urbanized areas such as Rukpoku, Ozuoba, Ogbogoro, Rumuagholu and Rumuekini. Establishment of sufficient Financial Institutions at selected locations is essential to ensure optimum services delivery in the study area, factors responsible for the deficiency of Financial Institutions in noted locations should also be addressed.

Keywords: Geospatial, Urbanization, Financial, Banking.

Introduction

Background of the Study

Geospatial distribution is the statistical arrangement of phenomenon across the Earth’s surface and the geospatial display of such arrangement is an important tool in geographical
and environmental statistics (Eze, Kaboufou and Douglas, 2023). Financial Institutions performs all kinds of transactions that includes providing various financial services in order to make life easier the public. Bank customers demand speed and convenience in financial transactions, high efficiency and confidence in their investments and financial services with convenient limits and reasonable cost. Financial Institutions in Nigeria are established for the purpose of rendering Financial and social services to the public. The cashless financial policy briefly introduced by the Federal Government of Nigeria through the Central Bank exposed the flaws of commercial Banks from discharging her responsibilities with hundreds of customers left displeased and frustrated. The demand for effective and stress free banking services by Bank Customers in the study area cannot be overemphasized, this necessitated the need for this study which is aimed to examine the geospatial distribution of Commercial Banks in the study area with the objectives of determining the spatial patterns, examine the distribution across municipals, create a database of commercial banks and produce a spatial distribution map of the study area.

Some related literatures were reviewed in the course of this work. Olagoke and Awodumi (2012), utilizes road network analysis built in ArcGIS 10.4 to determine the service area, shortest and alternative shortest routes to each financial institution in the study area in a study on Spatial Distribution of Banks and Customers Mobility in Ibadan North Local Government, Oyo State. The study revealed that financial institutions were clustered around commercial and institutional areas while less consideration were given to residential areas. It also noted that majority of the customers spends between 100-150 naira on transport to access their various institutions for physical transactions while 39% of customer’s trek to their respective institutions. The study adopted Geospatial technique to map the locations of the existing banks and to determine the spatial distributional pattern of banks in the study area through Average Nearest Neighbour Analysis.

El-meouch, Tesits, and Alpek (2022) in a research on measuring spatial distribution in the banking system in Hungary noted that residence population, insecurity, the proportion of enterprises per capita, the average income, the number of neighboring bank branches and the type of settlement all proved to be significant factors that may encourage decision-makers to establish a commercial bank branches in the study area. The study which was aimed to explore the distribution pattern of commercial banks in the study area revealed that commercial banks were not properly distributed. Linear regression based on Ordinary Least Squares (OLS) parameter estimation was used to explore the factors influencing the location of bank branches. In addition, the possible clustering of bank branches was observed, with whether spatial autocorrelation present at certain stages of the analysis. Geographically Weighted Regression (GWR) was also estimated in the study.

**Study Area Description**

The study area covers parts of Port Harcourt Urban which comprises of the present day Port Harcourt City and Obio/Akpor Local Government Area of Rivers State of Nigeria. It is located between Latitudes $4\degree45'N$ and $4\degree55'N$ and longitudes $6\degree50'56''E$ and $7\degree7'80''E$ (Eludoyin, 2010). The study area is influenced by industrialization cum urbanization as small communities are now megacities due to high influx of people resulting to population growth overtime, its lowland area with an average elevation 27m above sea level. Significant changes in the land Use/land cover in the area include changes in water bodies, built-up areas, and depletion of the mangrove vegetation along rivers and creeks shorelines, vegetation, and wetlands. The tropical monsoon climate is characterized by heavy rainfall from April to October ranging from 2000 to 2500 mm with high temperature all the year round and relatively constant humidity. Due to continuous heavy rainfall and river flow, the study area experiences severe flooding almost every year with annual rainfall ranges between 2100mm-4600mm and...
the mean temperature ranges between 30.0°C – 33.0°C as (Nigerian Meteorological Agency, 2022).

**Material and Methods**

**Hardware Selections**

i. Handheld Receiver Garmin GPS 76csx  
ii. HP laptop

iii. Printer  
iv. UTM application on phone which was adopted.

**Software Requirement**

i. ArcGIS 10.1
ii. Integrated Land and Water Information System (ILWIS)
iii. AutoCAD (computer aided design).

The choice of ArcGIS 10.1 software is its capacity to perform vector based operations.

Equipment Used

Materials/instruments used for this study are listed in table 2.1:

<table>
<thead>
<tr>
<th>S/N</th>
<th>Items</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Handheld Garmin 76 csx GPS</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Toyota Corolla (2007 model) car</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Field book</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Smartphone</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>School identification card (ID)</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Face mask</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Reflective Vest</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 1. Equipment / Materials Selected for the Study

Methods

The study was conducted based on quantitative paradigm. Geospatial technique which involves direct field observation with Garmin 78s GNSS receiver to obtain spatial information of commercial Banks across locations of the study area was utilized. The observed data were charted in Open Street Map (OSM) of 2022 and were identified as point feature. Arc-GIS 10.1 vector based GIS software was used to process and manipulate the observed field data. The following actions were carried out to achieve the objective of the study.

Instrument Test

The handheld GPS receiver (Garmin 76csx) was tested to ensure it performs at designed optimum level. The instrument manufacturer recommends an accuracy limit of three meters (3m).

Instrument Configuration

The Garmin 76 Handheld GPS Receiver was configured as shown in table 2.2 to suit the purpose of the research.

Table 2. Configuration of the Handheld GPS

<table>
<thead>
<tr>
<th>S/N</th>
<th>Item</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tracking</td>
<td>Maximum Accuracy</td>
</tr>
<tr>
<td>2</td>
<td>Minimum Satellite required</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Time Format</td>
<td>24hrs</td>
</tr>
<tr>
<td>4</td>
<td>Date</td>
<td>Automatic</td>
</tr>
<tr>
<td>5</td>
<td>System</td>
<td>UTM</td>
</tr>
<tr>
<td>6</td>
<td>Zone</td>
<td>32N</td>
</tr>
</tbody>
</table>

GPS Receiver Instrument Calibration

The Handheld GNSS Receiver was calibrated using two control points; SVG/GPS 002 and WGPS 003. This was achieved by comparing the observed coordinate of each of control points with the coordinate obtained from the Department of Surveying and Geomatics, Rivers State University. The difference obtained was in millimeters hence the GNSS receiver proved to be in good condition and deployed for the field work.

Table 3. Difference Between Existing and Observed Coordinate

<table>
<thead>
<tr>
<th>Stations</th>
<th>Obtained Coordinate</th>
<th>Coordinate of Base Station</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eastings (m)</td>
<td>Northings (m)</td>
<td>Eastings (m)</td>
</tr>
<tr>
<td>SVG/GPS 002</td>
<td>275963</td>
<td>530903</td>
<td>275962.761</td>
</tr>
<tr>
<td>WGPS 003</td>
<td>275993</td>
<td>530933</td>
<td>275992.841</td>
</tr>
</tbody>
</table>

Primary Data Source

The primary sources of data acquisition involve data obtained from direct field observation.
Spatial data of all commercial banks in the study area were acquired with the use of the Germin 76s GNSS receiver, ground coordinates of commercial Banks locations were obtained in the form of Northings and Eastings coordinates.

GPS observation was carried out based on the principles of GPS positioning. The precise travel time of the signal is necessary to determine the distance, or so-called range, to the satellite. Since the satellite is in an orbit approximately 20,200 km above the Earth, the travel time of the signal will be roughly 0.07 sec after the receiver generates the same signal. If this time delay between the two signals is multiplied by the signal velocity (speed of light in a vacuum) \( c \), the range to the satellite can be determined from;\[ r = c \times t \] (1), where \( r \) is the range to the satellite, \( t \) is the elapsed time for the wave to travel from the satellite to the receiver and \( c \) is the range to the satellite. Satellite receivers in determining distances to satellites employ two fundamental methods: code ranging and carrier phase-shift measurements, from distance observations made to multiple satellites, receiver positions are calculated (Eze, Kaboufou and Douglas, 2023).

Data Processing

The ground coordinates of various Banks position were charted in the Open Steet Map (OSM) to ascertain the ground positions of each Banks, the coordinates were later exported into the ArcGIS 10.1 vector based software for vector operation, the various Banks positions were identified as point feature in the Arc-GIS 10.1 vector based GIS software, the observed data was thereafter processed and manipulated and map model was produced.

Denotation of Features

1. Attribute data such as Buildings (old and new), Roads (major, minor and street), vegetation, contours, were entered into ArcGIS 9.2 environment, with shape files created for each of the attribute data such as the name of the digitized building, road with their areas, lengths and address and status. The data were generated during data acquisition from the field and they were all classified under the following:

2. Polygon: Building
3. Lines: Roads
4. Polygon: vegetation
5. Lines: contours
6. Lines: track roads

Results and Discussions
Plate 3. MS Excel Database of some Commercial Banks in the Study Area

Table 5. Some Commercial Banks in the Study Area

<table>
<thead>
<tr>
<th>S/N</th>
<th>Names</th>
<th>Location</th>
<th>Eastings (m)</th>
<th>Northings (m)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>United Bank of Africa</td>
<td>Choba Campus, Uniport</td>
<td>267998</td>
<td>541632</td>
<td>Plaza Complex</td>
</tr>
<tr>
<td>2</td>
<td>First Bank of Nigeria</td>
<td>Choba</td>
<td>267983</td>
<td>541581</td>
<td>Duplex</td>
</tr>
<tr>
<td>3</td>
<td>Zenith Bank Plc</td>
<td>Abuja Campus, Uniport</td>
<td>269572</td>
<td>542123</td>
<td>Duplex</td>
</tr>
<tr>
<td>4</td>
<td>Polaris Bank</td>
<td>203/204 Rumolu by Flyover</td>
<td>278949</td>
<td>534562</td>
<td>2 Storey Building</td>
</tr>
<tr>
<td>5</td>
<td>Unity Bank</td>
<td>29 Old Aba Road, Rumuomasi</td>
<td>280923</td>
<td>534815</td>
<td>3 Storey Building (Plaza)</td>
</tr>
<tr>
<td>6</td>
<td>Access Bank</td>
<td>13 Old Aba Road, Rumuomasi</td>
<td>280923</td>
<td>534815</td>
<td>2 Storey Building</td>
</tr>
<tr>
<td>7</td>
<td>First Bank of Nigeria</td>
<td>First Bank Bus Stop, Rumuomasi</td>
<td>280408</td>
<td>534838</td>
<td>Bungalow</td>
</tr>
</tbody>
</table>

Source: Author’s Field Data, 2022
Figure 2. Analysis of Commercial Banks in the Study Area

Figure 3. Linear Distribution of Commercial Banks in Rumuokrushi Town

Figure 3. shows that commercial Banks in Rumuokrushi town are linearly distributed.

Figure 4 also indicates that the commercial Banks in Rumuokwuta are linearly distributed.

Figure 5 indicates that the spatial pattern of Rumuokoro Town are randomly distributed.
Figure 4. Linear Distribution of Commercial Banks in Rumuokwuta Town

Figure 5. Random Distribution of Commercial Banks in Rumuokoro Town
Figure 6. Linear Distribution of Commercial Banks at Choba Town

Figure 7. Distributions of the Commercial Banks across Wards in the Study Area

Figure 8. Spread of Commercial Banks across Communities in parts of Port Harcourt
Table 6. Some Microfinance and Insurance Institutions in the Parts of Port Harcourt

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name of Financial Institution</th>
<th>Location</th>
<th>Easting (m)</th>
<th>Northing (m)</th>
<th>Building Occupied</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U &amp; C Microfinance Bank</td>
<td>Choba</td>
<td>269170</td>
<td>542063</td>
<td>Duplex</td>
</tr>
<tr>
<td>2</td>
<td>Trust Funds Pension</td>
<td>Rumumasi</td>
<td>279858</td>
<td>534091</td>
<td>3 Storey Building</td>
</tr>
<tr>
<td>3</td>
<td>Hawk Funds Multipurpose Cooperative Society Ltd</td>
<td>Rumumasi</td>
<td>279931</td>
<td>534690</td>
<td>3 Storey building</td>
</tr>
<tr>
<td>4</td>
<td>Nigeria Social Insurance</td>
<td>302 Aba Road Rumukrushi</td>
<td>284443</td>
<td>536391</td>
<td>3 Storey Building</td>
</tr>
<tr>
<td>5</td>
<td>Lapo Micro Finance</td>
<td>Rumuokrushi</td>
<td>284672</td>
<td>536489</td>
<td>3 Storey Building</td>
</tr>
<tr>
<td>6</td>
<td>Accion Microfinance Bank</td>
<td>14 old Aba Road, PH.</td>
<td>282624</td>
<td>535439</td>
<td>3 Storey Building</td>
</tr>
</tbody>
</table>

Source: Author’s Field Data, 2023

Figure 9. Numbers of Financial Institution Identified in parts of Port Harcourt

Figure 10. Percentage (%) Rate of Financial Institutions Recorded in Parts of Port Harcourt
Discussions of Findings

The research findings revealed that commercial banks were not spread across the study area. A total number of One Hundred and Twenty Three (123) Financial Institution were identified in the Study Area, with 87 Commercial Banks, 19 Microfinance Bank and 10 Loan / Insurance Firm identified respectively. Some of the Commercial Banks Identified includes First Bank of Nigeria, United Bank for Africa (UBA), Guarantee Trust Bank (GTB), Eco Bank, First City Monument Bank, Fidelity Bank, Access Bank, Zenith Bank, Heritage Bank, Polaris Bank and Sterling Bank among others. It was also found as shown in figure 2, that First Bank of Nigeria has the highest number of branches with seventeen (17), followed by Access Bank with eleven (11) and Fidelity Bank with ten (10) branches respectively, whereas UBA has nine (9), Zenith eight (8) and GTB eight (8) branches among others. It was also noted that the distribution of Banks cuts across densely urbanized areas, such as Rumuokoro, Diobu, Government Reserved Area, Rumuokwuta and Town axis with very few located in Trans-Amadi axis, Rumuepirikom, Rumuolumeni, Rumuola and Choba Towns, Clustered, linear and random distribution (spatial patterns) of commercial banks were also noted as no Bank was found in highly urbanized and densely populated areas such as Rukpoku, Ozuoba, Ogbogoro, Rumuahholu, Rumuekini among others. Figures 6 and 7 showing spread of commercial banks across some communities and wards in the study area reveals that communities such as Rumuokrushi in ward (13) host thirteen (12) Banks, with Rumuokoro in ward (6) hosting eleven (11) Choba in ward fifteen (15), ten (10) Banks, Rumuomasi in ward (3), six (6) Banks and Rumuogba in ward (7) five (5) Banks respectively, among others.

Conclusion

The research findings have clearly justified the necessity of this study. The efficacy of geospatial technique as a veritable tool for vital decision making in the establishment and management of
commercial Banks for optimum service delivery was demonstrated in this study. Necessary precautions were taken in all process that lead to achieving the study aim, especially during ground coordinates observation cum data processing.

Recommendations

Immediate citing of commercial Banks in noted communities is required for optimum service delivery to the public.

(i) Factors responsible for Financial institutions not been cited in noted locations especially insecurities should be addressed.

(ii) Geospatial Solutions should be deployed for continuous and up-to-date mapping of Banks locations and decision making for optimum service delivery to the public.

References


