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Spatial Mapping and Analysis of Functional facilIties: Implications for Rural-Urban Development in Delta State, Nigeria.

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Abstract
This article examines the spatial mapping and analysis of functional public facilities with respect to their implications for settlement development in Delta State. The specific objectives are to: ascertain the existing facilities in all the settlements in Delta State; ascertain the geo-locations of the functional facilities for mapping; produce location map of the functional facilities across the state; examine the relationships between the functional facilities and population distribution and examine the accessibility of population centers to public facilities in Delta State. The study adopted the central place theory as propounded by Walter Christaller in 1933 as the theoretical framework. Data were sourced from primary and secondary sources and Geospatial tools were applied to the data obtained. Regression and correlation analysis were carried out for the various indices. The study produced digital map of facilities in Delta State and established a relationship between available facilities and human population. Among the findings are that: large population centres tend to have more number and higher order types of facility within Delta State with a correlation between population and functional index of facility occurrence of r = 0.60 which is considered significant at 1% level of probability. Also, the study identified areas of positive and negative residuals and concluded that, with a coefficient of determination of 0.02, road distance factor alone explains only about 1% of the variation in the distribution of facilities throughout Delta State. The study suggested new roads/links to be constructed which will increase the spatial access to both urban and rural area.

Keywords: Spatial Mapping, Spatial Analysis, Functional Facilities, Delta State, Nigeria.

Introduction

All essential services necessary for the development of settlements depend on the existing basic facilities that are available to satisfy human needs. Apart from the basic needs of human such as food, clothing and shelter; the institutional responses to the provision of other essential facilities is important for human adaptation and societal development. These facilities according to Wesołowska (2016) include health, environmental, agricultural, water resource, oil and gas, vegetation and energy; while others include transportation, telecommunication, safety, recreation, education, banking and sports (Rodrigue, 2016).

For several decades now, human population has increased tremendously. At the same time, the number of inhabitants within different regions continues to grow. This increased population has implications on the available facilities in places within different regions of the world. Rural-urban migration has been mainly due to the quest for better social and economic conditions and general comfort for human existence (Ndakara, Atuma & Boyitie, 2021).

Both rural and urban development depend heavily on functional amenities like healthcare facilities, educational institutions, energy infrastructure, transportation networks, parks, and systems for managing waste and water. In addition to being necessary for the provision of fundamental services, these facilities are also critical for stimulating economic growth, improving the standard of living, and advancing sustainable development (Atubi, 2025a)

The gap between rural and urban areas can be considerably narrowed in rural areas when there are operational facilities. Human capital development, which in turn fuels economic productivity and growth, depends critically on having access to high-quality healthcare and education (World Bank, 2020).

Therefore, in other to ensure an adequately comfortable level of living, many factors have to be considered. One of such important factors is the provision of access to facilities as opined by Ohwo & Ndakara (2021). Adequate provision and developed facilities have been observed to favour rapid social and economic development, while lack of facilities lead to reduced levels of attractions of the area to investment thereby leading to emigration of inhabitants to further quest for better living standards (Sajini et al 2025, Wesołowska, 2016).

Statement of the Problem

At present, Delta State of Nigeria has a population of 4,098,291 (Worldometer, 2020). Despite this high population which has been on the increase for decades, many parts of the region lack some of the essential facilities which are basic components of the human settlement's functioning. In some parts of the state where some of the facilities are found, they are either incomplete/ abandoned projects or non-functional. Among the few functional government owned facilities, attentions have long been directed against the proper maintenance of such facilities for their effective functioning.

Many settlements within Delta State cannot be easily reached by road, and such settlements are cut off from the developmental communication links to other parts of the world. Communities within the riverine environment depend only on the movement through the rivers and creeks. Waste facilities are not also available in many locations thereby leads to uncontrolled waste dumping; while municipal solid wastes cannot be managed due to non-availability of facilities. Environmental protection is an element that should be taken into account at every stage of the planning of activities in the community. Mixed municipal solid waste, green and biodegradable waste and sources separated waste, must be processed at the regional plants for municipal waste treatment. Health facilities are not evenly located. Many settlements do not have electricity. As important as water to the human existence, many settlements within Delta State still suffer non-availability of potable and clean water for human consumption. In most settlements where these facilities are located, accessibility is a major limiting factor. While the Delta State and federal governments have made efforts at providing roads, health care centers, pipe-borne water and school facilities in Delta State, their spatial locations and mapping are in doubt. Their locations are non-spatial and they stop functioning due to lack of maintenance thereby posing as threats to the socioeconomic activities and livelihoods of the inhabitants within Delta State; while in some cases, the facility projects are incomplete and abandoned.

Different studies have been carried out to examine the roles of facilities in the social, economic and environmental development of settlements. Study by Wesołowska (2016) examined urban infrastructure facilities as essential public investment for sustainable cities in Warsaw, Poland. The study reported that municipal solid waste facilities are essential for the sustainability and development of cities. This report corroborates findings reported in a study by Rigamonti et.al (2016), which reported that strong relationships exist between facilities and development with respect to environmental and economic sustainability. In a study by Rodrigue (2016) on the role of transport and communication facilities in realizing development outcomes, findings revealed that transportation is an important tool for sustainable economic development in any given region. This report corroborates findings earlier reported in a study by Lakshmanan (2011). Cidell (2015) investigated "the role of major infrastructure in subregional economic development: an empirical study of airports and cities". Findings revealed that the establishment of airport improves economic development of settlement thus, corroborates findings earlier reported by Himanshu et al (2013) in their studies on "the role of infrastructure in improving human settlements".

From these studies, spatial mapping and analysis of functional facilities with respect to their implications for development have not been adequately documented. As such, this study is set at spatial mapping and analysis of functional public facilities with respect to their implications for settlement development in Delta State, with the specific objectives being to: **a**scertain the existing facilities in all the settlements in Delta State; ascertain the geo-locations of the functional facilities for mapping; produce location map of the functional facilities across the state; examine the relationships between the functional facilities and population distribution and examine the accessibility of population canters to public facilities in Delta State.

Theoretical Framework

This study is hinges on The Central Place Theory as propounded by Walter Christaller in 1933, Altawheel

(2020). The justification for the application of the central place theory (CPT) for this study is based on the fact that:

- The theory is used to explain the economic relationships of cities and smaller settlements.
- It captures the essence of locational analysis, that is, the concept underscores why cities, towns, villages, hamlets etc. are located where they are geographically, and the spatial interaction between the regions.
- Furthermore, it is used to explain flat and homogenous terrains, (isotropic landscapes) which are similar to homogenous surfaces.
- It emphasizes the relationship between rural and urban settlement, that is, as settlement grow or develop from rural status to urban, the range and function that it provides also grow. The outcome of such growth is the tendency to more specialized production and provision of greater services.

Atubi (2025b), stated that the Central Place Theory is typical of a region that is well connected with equal Transportation nodes, with a constant population density and purchasing power that varies in terms of the hierarchy of the settlements and availability of functional facilities that serves the settlements.

Rural and Urban Communities within each Local Government Area in Delta State are a major consideration in this research in line with issues of ranking of settlement sizes. The Rank Size rule is the major feature of the Central Place Theory (CPT). For the purpose of this research, settlements within the threshold of 20,000 persons and above are ranked as Urban settlements while communities with less than 20,000 persons are ranked as rural areas, this justifies the ranked size rule in the hexagonal order of settlements which Walter Christaller (1893-1969) attempted to address in order to explain variation in settlement size and interaction in terms of movement, population and provision of goods and services at various levels.

Based on Walter Christaller's pontification on central places, the theory therefore, can be seen as a mental image of pattern of hexagons and networks that are realized when setting up the arrangements of different order of settlements with varying population in higher order settlements (cities, towns, villages and hamlets) including the consideration of the facilities available.

Atubi (2025b) further buttressed the relevance of the central placed theory in relation to settlements, population and the accessibility of the roads/ nodes that serve the complementary regions and distribution of goods and services would then be served to settlements closest to the central place, with the high order settlement offering specialized goods and services that requires a high threshold. This is applicable to Delta State which is homogenous region with interconnected nodes.

The study area, Delta State is not an exception to this hierarchical spread of settlements within and between regions in the state. Movement is inevitable wherever settlements exist and the flow of goods and services including the availability of functional facilities is crucial to all levels of settlements within the central places and the lower order settlements.

Material and Methods

This study examined data spanning the period of 1991 to 2019. A pilot survey was carried out for the purpose of planning and implementation. Data was obtained from both primary and secondary sources from each of the 25 Local Government Areas (LGAs) of Delta State. Stratified random sampling was adopted for the choice of sample communities. Rural and Urban communities within each LGA was considered, and was determined on the basis of threshold population cut-offs of 20,000 persons and above for urban areas, while communities with less than 20,000 persons was for rural areas. Two of such communities each for both rural and urban areas respectively from each LGA were chosen, giving a total of 50 communities (25 communities each for urban and rural areas) within Delta state. The local government head quarter of each LGA represented the urban settlements while a rural settlements with population less than 20000 were chosen to represent the rural equivalent.

For the purpose of this study, the following functional facilities was taken into consideration: (i) Physical infrastructures (housing and roads), (ii) Educational facilities, (iii) Medical/Health care facilities, (iv) Energy and Power supply facilities, (v) Tourism and recreational facilities, (vi) Water resource facilities, and (vii) waste management facilities. The choice of these facilities was premised on their spatial availability and accessibility. Primary data were generated from field work which involved data capture of locational and attribute data of the aforementioned public functional facilities, using the Global Positioning System (GPS). Secondary data were obtained from various government parastatals and ministries within Delta State for the purpose of developing accurate inventories of functional facilities. Additional information were gathered from various literature and internet resources. Geographic Information System (GIS) was applied to the data obtained, thus: Geodatabase creation using a combination of Microsoft Excel and ArcMap; Base map creation and design; and GIS analysis, spatial adjustment and mapping of the various functional facilities for the various years spanning from 1991 to 2019. The hardware and software requirements for the aforementioned GIS operations included: Personal Computer (laptop), Global Positioning Systems (GPS), Microsoft Excel and ArcGIS 10 version.

Data Analysis

Statistical data analyses were carried out in the following manner: (i) Creation of an Accessibility Matrix and fitting of the Gravity Model to determine the influence and interactions, in terms of distance and cost, between the various sample communities. (ii) Correlation Analyses were carried out to determine the nature and extent of relationship between the population and facilities within communities. (iii) Student T-test statistics was applied to determine the occurrence of any significant difference between the rural and urban communities; and (iv) Linear and Multiple correlation analyses were carried out to determine, model, and predict the relationships between the rural and urban communities.

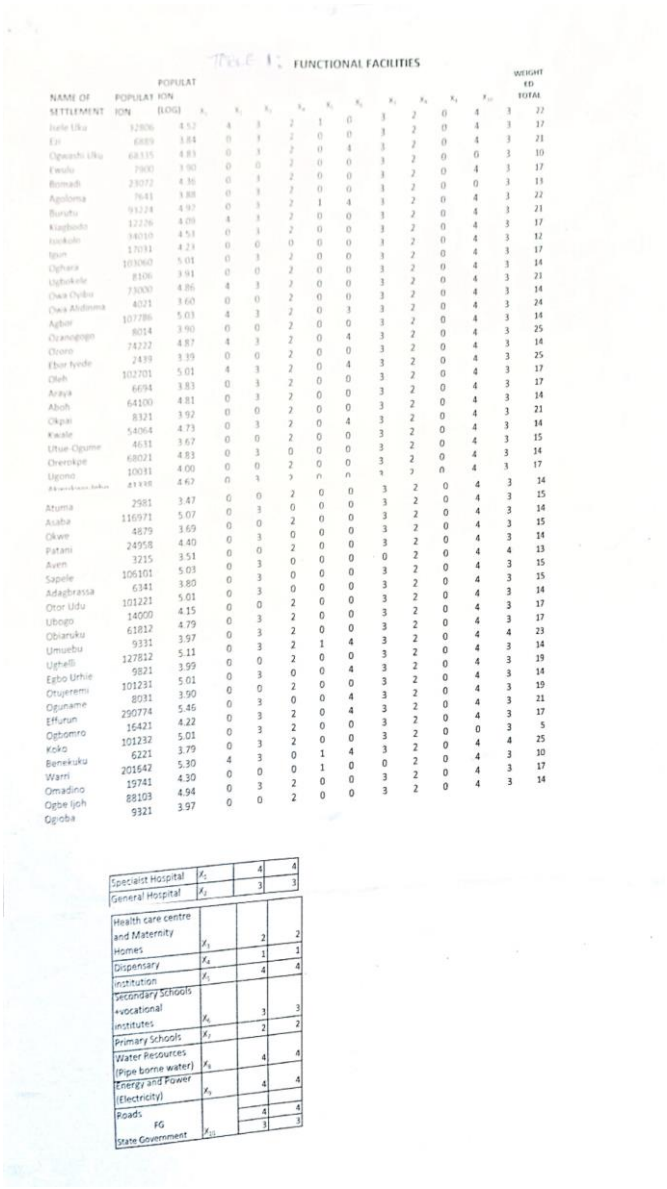
Results and Findings

In this study since part of the analysis is to relate the level of network accessibility to the occurrence of public facilities. An index of facility occurrence was constructed with the .weighting system that attached 4 to first order functions, 3 to second order, 2 to third order and 1 to fourth order functions.

However, having weighted the function, the product of the number of establishment of each function and the weight is summed up for a centre to give functional index of facility occurrence. This index shows the level of concentration of facilities in that centre (see table 1)

Table 1 gives the calculated indices for the 50 centres of the study area while fig 1 illustrates the distribution of functional indices.

Table 1. The calculated indices for the 50 centres of the study area



FUNCTIONAL FACILITIES

NAME OF SETTLEMENT	POPULATION	POPULATION (LOG)	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	WEIGHTED TOTAL
Isele Uku	12806	4.52	4	3	2	1	0	3	2	0	4	3	22
Ezi	6889	3.84	0	3	2	0	0	3	2	0	4	3	17
Ogwashi Uku	68335	4.83	0	3	2	0	4	3	2	0	4	3	21
Ewulo	7900	3.90	0	0	2	0	0	3	2	0	0	3	10
Bomadi	23072	4.36	0	3	2	0	0	3	2	0	4	3	17
Apoloma	7641	3.88	0	3	2	0	0	3	2	0	0	3	13
Burutu	93228	4.97	0	3	2	1	4	3	2	0	4	3	22
Kiagbodo	12226	4.09	4	3	2	0	0	3	2	0	4	3	21
Isiokolo	34010	4.53	0	3	2	0	0	3	2	0	4	3	17
Ijaw	17031	4.23	0	0	0	0	0	3	2	0	4	3	12
Ophara	103060	5.01	0	1	2	0	0	3	2	0	4	3	17
Ughokele	8106	3.91	0	0	2	0	0	3	2	0	4	3	14
Owa Oyibo	73000	4.86	4	3	2	0	0	3	2	0	4	3	21
Owa Alidinma	4021	3.60	0	0	2	0	0	3	2	0	4	3	14
Agbor	107786	5.03	4	3	2	0	3	3	2	0	4	3	24
Ozanogogo	8014	3.90	0	0	2	0	0	3	2	0	4	3	14
Ozoro	74222	4.87	4	3	2	0	4	3	2	0	4	3	25
Ebor Iyede	2439	3.39	0	0	2	0	0	3	2	0	4	3	14
Oleh	102701	5.01	4	3	2	0	4	3	2	0	4	3	25
Aniya	6694	3.83	0	3	2	0	0	3	2	0	4	3	17
Aboh	64100	4.81	0	3	2	0	0	3	2	0	4	3	17
Okpai	8321	3.92	0	0	2	0	0	3	2	0	4	3	14
Kwale	54064	4.73	0	3	2	0	4	3	2	0	4	3	21
Utue-Ogume	4631	3.67	0	0	2	0	0	3	2	0	4	3	14
Orerokpe	68021	4.83	0	3	2	0	0	3	2	0	4	3	15
Ugono	10031	4.00	0	0	2	0	0	3	2	0	4	3	14
[illegible]	43305	4.63	0	3	2	0	0	3	2	0	4	3	17
Atuma	2981	3.47	0	0	2	0	0	3	2	0	4	3	14
Asaba	116971	5.07	0	3	0	0	0	3	2	0	4	3	15
Okwe	4879	3.69	0	0	2	0	0	3	2	0	4	3	14
Patani	24958	4.40	0	3	0	0	0	3	2	0	4	3	15
Aven	3215	3.51	0	0	2	0	0	3	2	0	4	3	14
Sapele	106101	5.03	0	3	0	0	0	0	2	0	4	4	13
Adagbrassa	6341	3.80	0	3	0	0	0	3	2	0	4	3	15
Otor Udu	101221	5.01	0	0	2	0	0	3	2	0	4	3	15
Ubogo	14000	4.15	0	3	2	0	0	3	2	0	4	3	14
Obiaruku	61812	4.79	0	3	2	0	0	3	2	0	4	3	17
Umuebu	9331	3.97	0	3	2	1	4	3	2	0	4	4	23
Ughelli	127812	5.11	0	0	2	0	0	3	2	0	4	3	14
Egbo Urhie	9821	3.99	0	3	0	0	4	3	2	0	4	3	19
Otujeremi	101231	5.01	0	0	2	0	0	3	2	0	4	3	14
Oguname	8031	3.90	0	3	0	0	4	3	2	0	4	3	19
Effurun	290774	5.46	0	3	2	0	4	3	2	0	4	3	21
Ogbomro	16421	4.22	0	3	2	0	0	3	2	0	4	3	17
Koko	101232	5.01	0	3	2	0	0	3	2	0	0	3	5
Benekuku	6221	3.79	0	3	2	0	0	3	2	0	4	4	25
Warri	201642	5.30	4	3	0	1	4	3	2	0	4	3	10
Omadino	19741	4.30	0	0	0	1	0	0	2	0	4	3	17
Ogbe Ijoh	88103	4.94	0	3	2	0	0	3	2	0	4	3	14
Ogioba	9321	3.97	0	0	2	0	0	3	2	0	4	3	14

Specialist Hospital	X_2	4	4
General Hospital	X_3	3	3
Health care centre and Maternity Homes	X_4	2	2
Dispensary	X_5	1	1
Institution	X_6	4	4
Secondary Schools +vocational institutes	X_7	3	3
Primary Schools	X_8	2	2
Water Resources (Pipe borne water)	X_9	4	4
Energy and Power (Electricity)	X_{10}	4	4
Roads		4	4
FG		3	3
State Government	X_{11}		

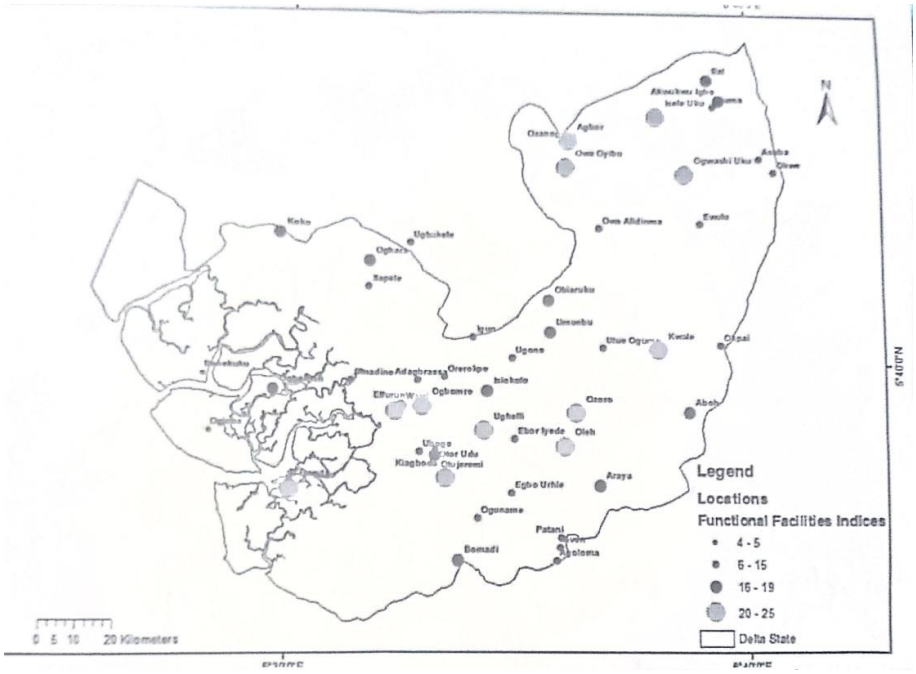


Figure 1. Map of Delta State Showing Functional Indices of Centres

Calculated indices for the 50 centres distribution of Functional Indices

In Table 2, the centres are ranked according to their level of accessibility for 2019. The higher the index, the less accessible the node and vice versa.

Table 2 gives the rank order of nodal accessibility by 2019 based on shortest road distance. From the table we observe that Warri (Ai = 2339.7) as the most accessible centre followed by Araya (Ai = 2357.2) and Kiagbodo (Ai = 2366.6) as the second and third most accessible centres in the network. Again we nnote that Benekuku, Ukepar, Otue, Ugume and Ogiuba remained the least accessible centres with (Ai = 4939.4, 4791.9, 4696.6 and 4659.8) respectively. Again these are rural areas of Delta State.

From the analysis we observe that there was also very meaningful development that took place in Delta State. The pattern of nodal accessibility shown in fig. 2 emphases the existence of a central area of highly accessible centre. From the map, we observe that 2000 equal accessibility line enclose Warri, Aroya, Kiagbodo and Sapele. The line clearly excludes an area along benekuku, Okpai, Otue, Ogume and Kwale axis which has low accessibility resulting from being poorly connected to the network. The existence of a central area which has remained consistently accessible throughout the period is best illustrated by figure 2.

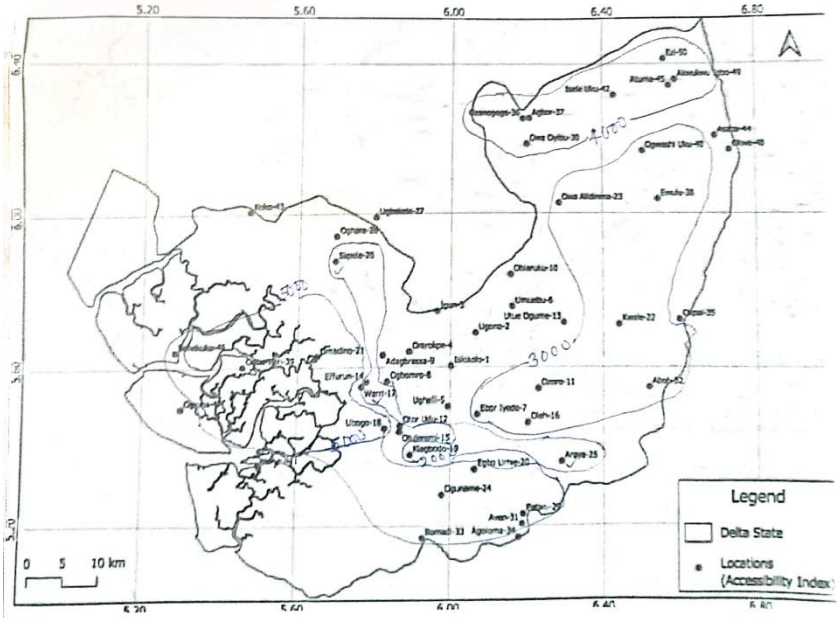


Figure 2. Delta State Showing Areas of Equal Accessibility as at 2019 (2001-2019)

Table 2. Rank Order of Nodal Accessibility Using Road Distance of Delta State, 2019

Node No	Nodal Tittle	Accessibility Index (1km)	Rank order
47	Warri	2339.7	1
20	Araya	2357.2	2
8	Kiagbodo	2366.6	3
33	Sapele	2426.3	4
48	Omadino	2443.9	5
13	Owa-Oyibu	2467.7	6
32	Aven	2476.3	7
38	Umuebu	2545.5	8
28	Atuma	2561.5	9
12	Ugbokele	2584.5	10
31	Patani	2587.7	11
29	Asaba	2622.3	12
35	Otor-Udu	2655.7	13
14	Owa Alidinma	2655.9	14
37	Obiaruku	2671.6	15
19	Oleh	2672.7	16
30	Okwe	2714.3	17
41	Otuieremi	2717.8	18
7	Burutu	2763.3	19
34	Adagbrassa	2791.7	20
15	Agbor	3069.7	21
42	Oguname	3069.8	22
10	Igun	3127.2	23
36	Ubogo	3132.9	24
27	Akunkwu-Igbo	3204.9	25
25	Orerokpe	3283.9	26
26	Ugono	3373.1	27
16	Ozanogogo	3420.9	28
3	Ogurashi	3479.8	29
4	Ewulu	3498.9	30
9	Istokolo	3513.6	31
17	Ozoro	3624.6	32
45	Koko	3751.1	33
11	Oghara	3761.7	34
49	Ogbe Ijoh	3761.7	35
43	Effurun	3827.8	36
2	Ezi	3940.7	37
21	Aboh	3941.8	38
6	Agofoma	3971.8	39
5	Bomadi	3974.3	40
18	Ebor Iyede	4258.6	41
39	Ughelli	4260.3	42
1	Isele-Uku	4285.7	43
44	Ugbomro	4607.0	44
40	Egbo urhie	4615.3	45
23	Kwale	4646.9	46
50	Ogioba	4689.8	47
24	Otue-Ogume	4696.6	48
22	Okapi	4791.9	49
46	Benekuku	4939.4	50

In establishing a relationship between population and functional indices we consider both the correlation and regression. Correlation measures the degree of association between variable while the regression measures the amount one data set called the dependent variable is related to or is as a result of the other called the independent variable.

The regression equation estimates the values of the dependent variable from known values of the

independent.

In this analysis we use the simple regression. A possible relationship between accessibility and human activities has been suggested by Lachene (1965) Chapman (1979) among others while Keeble et al (1982) actually established a relationship between accessibility and economic activities among the countries of the EEC (EU). Within the country Atubi (2012) has in Lagos State and Delta State suggested some relationship between accessibility and public facility index, while Ali (1997) suggested some relationship between accessibility and bus transport services in Enugu.

We have earlier said that for access to have meaning, it should be people oriented. Hence we attempt to account for how much population distribution affects the distribution of facilities.

The correlation between population and functional index of facility occurrence gives r = 0.60 which is considered significant at 1% level of probability. This means that large population centres tend to have more number and higher order types of facility within Delta State.

Log (F_1) = 14.976 + (pop) – 0.386 …… (1)

The standard error of the estimate is 3.327 and it gives a closer estimate.

The coefficient of determination of the relationship is given as 0.36 which indicates that population has no strong effect and explains 0.60% of variation in the distribution of facilities in Delta State.

The areas of negative residuals in this case indicates that there are less facilities than expected at a given population level. We identify these areas as:

i. The northern zone made up of Kwale and Isele-Uku. This area was identified as having poor accessibility but here it would seem that based on the population size, centres are also under supplied with important facilities. The population of centres range from Kwale (54,064), Isele-Uku (32,806) and Akwukwu – Igbo (41, 338).

ii. Burutu – Ogbe – Ijoh (Southern zone) which has also large population centres that seem to lack important facilities relative to their populations. Except perhaps Kiagbodo which has general hospital/private hospital. Accessibility wise, we observe that Kiagbodo and Oleh are located in the zone of good accessibility, their population more than accessibility is contributing to their low level of facility occurrence.

iii. Central Sapele area which comprises Otor-Udu (101,221), Orerokpe (68,021) and Oghara (103,060) were identified as highly accessible centres. Although possessed of large population in these centres do not seem to have attracted enough facilities relative to their population Igun-Sapele axis.

The coefficient indicates that the association between accessibility and functional index is not strong. We also observe that a good number of centres with low accessibility have high functional index and vice versa. Areas with the shortest road distance to all parts of the study area do not have more facilities. This is further discussed in analysis of residuals.

However, we observe that there are two areas of positive residuals. The first are those areas which have high accessibility indices and also corresponding high functional indices. These are identified as 1, 2, 3, 4, 5, 6 or Warri areas Kiagbodo, Araya, Owa-Oyibu, Asaba and Effurun areas respectively. The second are those areas with low accessibility indices but high functional indices relative to the surrounding centres. These are marked. They are identified as Ozoro, Isiokolo, Oleh, Isele-Ukwu and Ughelli respectively.

Within the first group we observe that the network of roads is high and centres are at shortest distances from each other. Driving time with in the centres in this group ranges from 20 minutes in Warri area to about 45 minutes in Kiagbodo – Araya axis. For these areas it may be plausible to say that high level of accessibility is a contributory factor in attracting the concentration of facilities.

Thus Owa-Oyibu with the sixth highest accessibility index also possesses a good number of facilities-General hospital, Health care and maternity home, Dispensary, pipe-borne water and federal road. The same may be said to sure degree of Sapele, Oreokpe, Asaba and Ughelli. For these centres, it may be said that accessibility brings establishment of facilities and establishment of facilities demands improvement of accessibility. Uniquely Ugono has the seventh greatest functional index both in number and types of facilities. Yet Benekuku is at the verge of the periphery of the study area. So its importance has not much to do with its accessibility to other parts of Delta State.

In the analysis of areas of negative residuals which indicate areas having less than expected level of facility occurrence, we also notice a wide distribution of centres throughout Delta State. In fact, the areas of negative residuals are around the areas of positive residuals. We have centres that are peripherally located marked by high accessibility indices such as Ogbe-Ijoh (Ai = 3761.7), Benekuku (Ai = 4939.4) and Otue-Ogume (Ai = 4696.6) which have low indices of facility occurrence. This may look like neglect if case can consider distance accessibility alone. However, these centres have low population and this could account for the low level of facility occurrence.

This gives us about 0.02 or 1% implying that the road distance factor alone explains only about 1% of the variation in the distribution of facilities throughout Delta State. These therefore suggests that other factors are more important. It also invalidates the general believe that claims that areas of high accessibility should also have high concentration of facilities and we are therefore led to seek further explanation on other factors.

The analysis using multiple correlation statistics determine the combined effects of all the variables on the occurrence of public facilities in Delta State with a correlation value of 0.62. The percentage of variation of occurrence of public facilities which can be determined by the 3 variables is gotten by squaring the multiple correlation value thus

$R^2 = 0.40 = 40\%$

The square (R2) is called the coefficient of multiple determination. For it tells us the proportion of variance in the dependent variation that is explained by all the independent variables combined.0.40 is called the coefficient of multiple variation hence 40% of variation in public facilities occurrence in urban and rural areas of Delta State are due to the combined effects of accessibility index, population and functional index leaving 60% to other factors.

This should not be surprising as areas such as Ebor Iyede Uagbokele Owa-Alidinma and Ugono with low population and have few public facilities, while areas like Ughelli, Warri, Oleh, Ozoro and Owa-Oyibu have high accessibility, high population and hence high concentration of public facilities.

On the other hand, there are some areas with low accessibility, high population and hence low concentration of public facilities such areas are koko, Bomadi and Ogbe-Ijoh.

Obviously, therefore, the 3 indices i.e. accessibility index, population and functional index must also be given due consideration in the distribution in location of public facilities in Delta State.

Policy Implications

On the bases of findings of this study, the following recommendations were made:

1. Government should provide those services which centres (i.e. urban and rural centres) lack based on extensive surveys of what this centre based approach might prove more useful if the people are guided to chose out of their presence.
2. Some new roads/links to be constructed were suggested primarily on the bases that they will increase the spatial access to both urban and rural centres, and reduce the movement to other centres (i.e. centres like Koko to Benekuku, Bomadi to Kiagbodo, Ogbe-Ijo to Kiogbodo and Bomadi to Burutu.

Conclusion

This study examines the spatial mapping and analysis of functional facilities with particular focus on the implications for rural – urban development in Delta State. It is obvious that spatial location of public facilities for both urban and rural areas cannot be properly done without reference to their accessibility by users. It is in recognition of the need for access to t facilities that this study analyzed the relationships between the functional facilities and population distribution and examine the accessibility of population centers to public facilities. These findings will help direct the distribution and re-organization of functional facilities for the optimum benefit of the masses

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