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ACCESSIBILITY AND THE PROVISION OF PUBLIC FACILITIES IN DELTA STATE, NIGERIA (1976-2016): A NEXUS

Geography

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ABSTRACT
The need for this research is based on the understanding that location of public facilities cannot be properly done without reference to their accessibility by users. It is in recognition of the need for access to facilities that various measures or re-organisations have taken place in Delta State. The data collected for the period between 1976 and 2016, were based on government documents. A classification of 50 sampled settlements, called centres, is first developed based on population size. By means of graph theory, the complex network of roads is abstracted into set of nodes and edges. These nodes were subsequently weighted according to their number and functions. Also, the Pearson's Product Moment Correlation Coefficient was employed as well as the students 't' test. The analysis reveals a certain pattern of association. That the high correlation coefficient between specialist hospitals and post secondary institutions (r = 0.60) does not mean that occurrence of a hospital, necessarily lead to the occurrence of post – secondary institutions, but it does imply that both tend to be located in the same place within the study area. On the basis of the findings of this study recommendations were suggested on how to improve accessibility and promote the equitable provision of public facilities in Delta State, Nigeria.

KEYWORDS
Public Facilities; Accessibility; Provision; Delta State; Nexus.

INTRODUCTION
A considerable research effort has been devoted to road network planning models over the last forty years. The vast majority of these efforts were oriented towards two models; the discrete network design problem (DNDP) model and, especially, the continuous network design problem (CNDP) model. The former focus on the addition of new links to a road network, whereas the latter concentrates on the (continuous) expansion of capacity of existing links. Both models are built around an efficiency objective – typically the maximization of user benefits or the minimization of user costs. Among the best known articles where these models are dealt with one may quote LeBlanc (1975) and Boyce and Janson (1980) regarding the DNDP model, and Abdulaal and LeBlanc (1979), Leblanc and Boyce (1986) Suwansirikul et al (1987) and Friesz et al (1992), regarding the CNDP model. For a relatively recent review of this literature, see Yang and Bell (1998), and Atubi, (2012f).

In those countries where the basic road network is in complete, it will usually be appropriate to adopt a relatively low level of geometric standards in order to release resources to provide more basic road links. This policy will generally do more to foster economic development than building a smaller number of road links to a higher standard (Transport and Road Research Laboratory, 2006). In an attempt to satisfy this high degree of spatial interactions, transport system has been provided on a large scale and various modes of transport have been developed. Thus, rail, road, sea and air routes have been developed to move people and goods; pipelines to move oil, water and natural gas, and overhead cables to move information and render other services. The development of these modes of transport provides the various transportation networks and as Toyne and Newby stated "networks may be regarded as geographical features underlying the whole of human and economic activity; without them there can be neither movement, change, development nor function, all of which are the fundamental pre-requisites of activity of any kind" (Toyn and Newby, 2004, p. 173).

One of the goals of regional planning is to ensure that infrastructural facilities necessary for development are made accessible to as many people as possible within the region. One way that planners have tried to meet this goal is the establishment of growth centres or poles where facilities are concentrated with the hope that the benefits of concentration will gradually trickle down to the surrounding areas.

However, Brian and Rodney (2009) observed that the comparatively low levels of economic activity in many of the less developed countries is often reflected in the modest scale of their transport systems. Early twentieth century studies of colonial growth frequently assessed

opportunities for agricultural or industrial expansion in the context of road or rail transport availability, implying that until adequate means of communication are provided little or no growth can take place.

Atubi and Ali (2006), examined the role of political policies in influencing transportation facilities in Warri metropolis, Delta State. They maintained that politics had more than desired influence on the city network and this is irrational to objective planning of transport network in such a large city. They also said that until the city was given a new dimension such as planning and reversing some existing policies, the traffic problems in metropolitan Warri would continue to be inexistence.

As a complement of creating more physical capacity through major investment in urban transport infrastructure, many cities have attempted to make more effective use of existing road space by traffic engineering techniques. Some have attempted to translate these techniques into effective traffic management schemes to reduce demand and/or give priority to moving people rather than vehicles – by providing facilities for high occupancy vehicles such as buses, (Midgley, 1995 and Chengliang Liu and Ruilin, 2012).

In areas where the population is unequally distributed as in rural areas, distributional equity may be seen in terms of the minimum number of people that lie beyond certain threshold distance from the location of facilities. Access defined as the weighted cost of travel to consume a public service can be regarded as a test of locational efficiency and equity in the distribution of public facilities.

In an urban area there is a complex mix of land uses and all the major broad groupings of persons movements (i.e journey to work official trips, educational trips by school children/students, shopping trips, journey made to get home, and miscellaneous journeys) in urban areas are made between them. Thus while trips are made for a variety of purposes, they are made to and from various landuses (Onokala, 1995, Atubi, 2008g).

Study Area
Delta State is bounded in the north by Edo State, the east by Anambra State, south-east by Bayelsa State, and on the southern flank by the Bight of Benin which covers about 160 kilometres of the state's coastline (see Fig. 1). Delta State is generally low-lying without remarkable hills, and covers a landmass of about 18,050 km^2 of which more than 60% is land. The state has a wide coastal belt inter-laced with rivulets and steams, which form part of the Niger Delta (The force of diversity, 2013). Presently, Delta State comprises 25 local government areas. The capital of Delta State is Asaba, and it is located

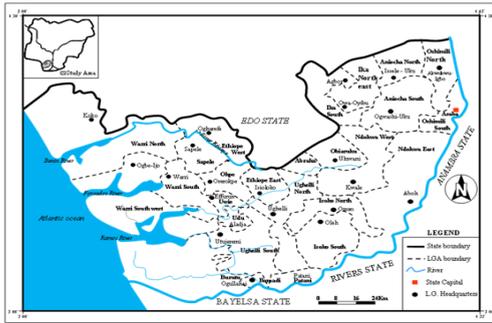at the northern end of the state with an estimated land area of 762 km^2.

FIG 1: MAP OF DELATA STATE SHOWING STUDY AREAS

Industrial growth would have been impossible without an expansion of transport network by river. Furthermore, navigable rivers provide avenue into the interior which in turn serves for development purposes. Inland water ways in the Delta has stood as a basis for spatial interaction between riverine communities and the hinterlands and urban centres.

The National Inland waterways authority (NIWA) has its headquarters in Lokoja, Kogi State, N.I.W.A. was established by a founding instrument of degree 13 of 1997, and it began operations in January, 1998. N.I.W.A has 10 area offices spread across the country and Warri is an area office, two standard workshops and dockyards (Warri and Lokoja) Ferry terminal (Lagos) jetties.

However, a growing economy requires a comprehensive and efficient transport system to move its goods and people to, from and within its boundaries. In recognition of its impact as an engine of economic growth, the Delta State government devoted a great percentage of their budgetary allocation to the development of transportation infrastructure services.

Furthermore, the transport sector allocation in the National Development Plans are quite considerable. The Delta State government, for instance, has over the past 15 years, constructed many highways and subways, flyover bridges, all designed to ease traffic congestion, and movement of goods and services.

A significant aspect of the infrastructural programme of the government is its strong resolve to integrate the riverine areas to the mainland through the construction of bridges. In this light several road projects have been completed including three gigantic bridges namely Ase – Igbuku, Bomadi and Omadiono – Ughoton. The completion of one of these bridges (Omadiono) which was abandoned by the federal government over 20 years ago has opened up the riverine areas for the extension of hitherto impossible developmental projects.

To complement the road construction activities of the Delta State ministry of works the government established the direct labour agency (DLA). The DLA was founded to accelerate the construction, rehabilitation and maintenance of roads across the state, with 6 zonal offices in Agbor, Kwale, Ughelli, Oleh, Oghara, Warri and 3 asphalf plants in Oghara, Agbarha-Otor (Inside Delta State, 2006) (see Fig. 2).
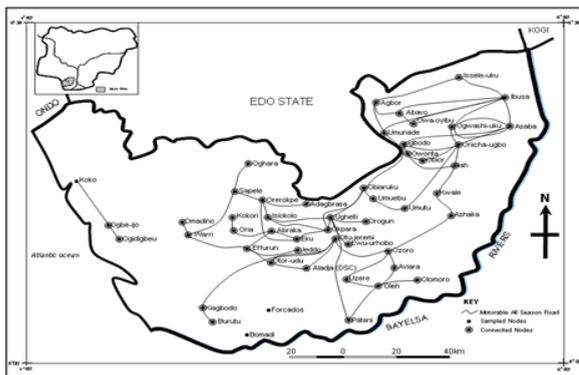

FIG. 3: Road Network Map of Delta State

Fig. 2: Road Network Map of Delta State
Source: Survey Development (2009) updated by fieldwork to reflect 2016 condition

The major destinations of the general aviation aircraft (Outside Asaba) are Lagos, Port-Harcourt, Kaduna and Abuja. The Osubi aerodrome was mainly established for domestic operations and not for international standard as a result, the navigational aids were purely for domestic operation but however, highly efficient. Consequently, the aero-contractors render services and support to oil companies, they buy and mount aircraft and give priority to customers that have previous arrangement with them.

However, there are four other airfields around the Osubi airport. These are at Ughelli, Agbarho, Escravos and Forcados. These airfields are only made up of runways and the company's office in which the communication gear are situated (see Fig. 3).
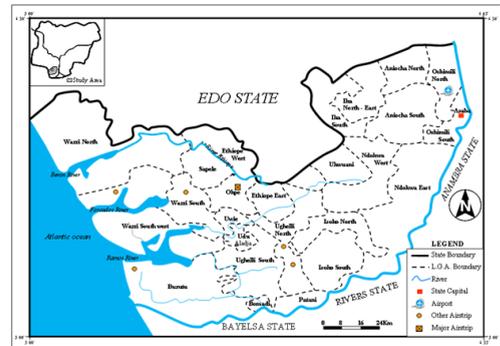

Fig. 3: Map of Delta State Showing Airstrips and Airport

Research Methods
In developing the research design, areas that are accessible to the road networks and with population of 10,000 and above at each period where taken as activity centres. Using 1976 as the base year any centre within the study area with a population of 10,000 and which is connected by the road network was regarded as a node. Population of 10,000 was chosen as cut-off point to enable a substantial number of centres, especially those at the end of routes to appear as nodes as the network grows. The choice of nodes was therefore, based on population size. Based on the adopted operational definition of major centres, 50 major centres were identified.

In order to classify the major centres, data on six areas of central facility provision were collected namely: medical, educational, market, postal services, banking and administrative headquarters. The choice of these facilities was based on the fact that they are capable of generating home-to-facility travels, hence such facilities as pipe-borne water, electricity etc, were not included because they lack this quality.
Data on the chosen facilities were collected both from published sources and field survey. A list of registered facilities in Delta State by 2015 compiled by the Delta State Ministry of Health, Asaba, list of primary schools, secondary schools and tertiary institutions in Delta State from the ministries of Basic Education and higher Education respectively and monthly returns of postal facilities from post and telecommunications (Nipost), federal secretariat headquarters, Asaba were used as the base data to collect the number of these facilities.

The data on the distribution of banks in Delta State were collected from central bank of Nigeria, Annex office, Asaba. While data on the distribution of markets were collected from the department of marketing, ministry of economic planning, it is however, important to note that the distribution of these facilities given in the text reflects conditions in 2015 only when the survey was conducted.

An analysis of correlation between the various variables was carried out. A correlation describes the degree of association or strength of relationship between two or more variables.

DISCUSSION OF RESULTS/FINDINGS
A number of descriptive classifications were employed in this study for describing and summarizing the provision of public facilities in Delta State. In order to classify the major centres, data on six areas of central facility provisions were collected and are discussed below.

At the end of 2015 there were about 1710 recognized health institutions with a total of 6443 beds throughout Delta State (Delta State Ministry of Health, Asaba, 2015). According to state ministry of health, health care facilities are grouped into special health facilities

and basic health facilities. The special health facilities include all hospitals, special units, public health laboratories and health training institutions. The basic health facilities on the other hand are of local importance. They include health centres, maternity homes and dispensaries.

The institutions are owned by either government (Federal, State and Local Governments), voluntary agencies (especially mansions) or by the private sector. The state government owns about 54 hospitals in Delta State with at least one in each Local Government Area. And these are directly managed by the hospital management board which for administrative convenience, has been grouped under eight medical zones. These are Agbor, Asaba, Akwukwu-Igbo, Bomadi, Kwale, Ogwashi-Uku, Ole, Sapele and Warri medical zones. Out of the 54 hospitals four with 100 beds each, have been designated central hospitals (Warri, Sapele, Ughelli and Agbor central hospitals), state hospital in Local Government headquarters are called general hospitals, while those sited in places other than LGA headquarters and which generally have 30 beds capacity each are known as government hospitals. There are many primary health centres (PHC) (538 material health centres, medical health centres, and maternity homes) run by the local government councils which complement the effort of the state government to bring health care delivery services. Also, there are numerous private hospitals and clinics (over 1109) that runs 24 hours health services in Delta State. Added to the above, is the Delta State university teaching hospital located at Oghara in Ethiope west Local Government Area and the Federal Medical Centre located at Asaba the state capital.

In terms of spatial distribution Fig. 4 reveals the pattern of health institutions. It can be said that Delta central senatorial zone (Ughelli North, Ughelli South "Uvwie, Ethiope East, Ethiope West, Okpe and Udu) and Delta North senatorial zone (Aniocha south, Ika North east, Ndokwa north east, Ukwani, Oshimili south and Ika South) Local Government Areas had the highest concentration of health institutions in Delta State. Another area of concentration is Warri South West, Uvwie, Ika South Oshimili South and Ughell North Local Government Areas which has the largest number of private facilities in Delta State. The peripheries of Ndokwa East, Patani and Warri North have relatively lower concentration of public health institutions.
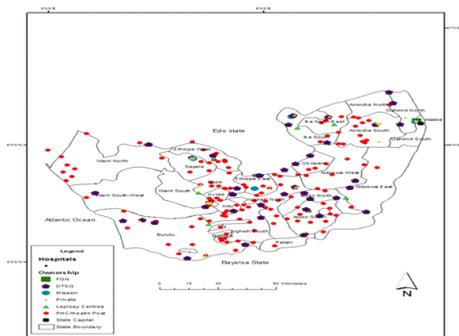
Fig. 4: Distribution of health institutions in Delta State
Source: Fieldwork (2016).

As at 2015, a summary of educational institutions reveals a total of 1 federal government secondary school, 369 secondary (senior and junior secondary schools), 1146 primary schools, 4 universities, 4 colleges of education, 1 school of marine technology, 3 polytechnics, 1 monotechnic. The post primary institutions which are government owned provides general, or academic, vocational and technical curricula. The number of schools represent 28% increase from 1991 figures. The school enrolment as at 2014/2015 stood at 200,384 representing an average of 543 students per school and 9 teacher/student ratio of 17:1 (Delta State Ministry of Basic Education, 2014). Although there has been an increase in school enrolment from 1991 there has been a decline in school population in recent times.

The primary schools wholly controlled by the Local Government Education Districts Center for children between the ages of 6 and 12 years with a population of 312,489. In 2014/2015 there was a decrease of primary school enrolment from the 1991 figure of 394,506. The pupil/teacher ratio is about 16 for Delta State. It is estimated that the average home-to-school walking distance ranges from 0.7 kilometres to 2.4 kilometres (Delta State Ministry of Basic Education, 2014).

Figures 5 a, b and c shows the distribution of educational institutions in Delta State. There is a wide distribution of educational institutions in Delta State especially of primary schools. However, there is greater concentration of primary schools in Aniocha South, Burutu, Ethiope East, Ethiope West, Ika North East, Ika South, Isoko South, Ndokwa East, Ndokwa West, Sapele, Ughelli South, Ukwani and Warri South Local Government Areas and Bomadi Patani, and Uvwie Local Government Areas has the lowest number of primary schools in Delta State.

While for secondary schools we have greater concentration around Aniocha North Aniocha South, Ethiope East, Ika North East, Ika South, Isoko North and South, Ndokwa East, Ndokwa West, Sapele, Ughelli South and Warri South. And Bomadi, Patani, Udu, Uvwie, Warri north, Oshimili South, Oshimili north, Okpe and Ethiope West being Local Government Areas that had the lowest concentration of secondary schools in Delta State.

However, there is an obvious unevenness in the distribution of schools in Delta State. The issue of urban/rural dichotomy does not explain the uneven distribution. Uvwie and Oshilimi South Local Government Areas are predominantly urban and has only 8 and 7 secondary schools respectively. Ndokwa East that is mainly rural has 16 secondary schools. One thing that is clear is that the Local Government Areas are not equal in size. Their sizes vary greatly.

There are 4 universities located in Delta State; these are Delta State University, Abraka. There is also Novena University at Ogume, Western Delta University, Oghara and Federal University of Petroleum Resources, Ogbomro. There is one monotechnic (that is the Petroleum Training Institute) at Effurun, Delta State. Delta State has three polytechnics, all owned and funded by the Delta State government.
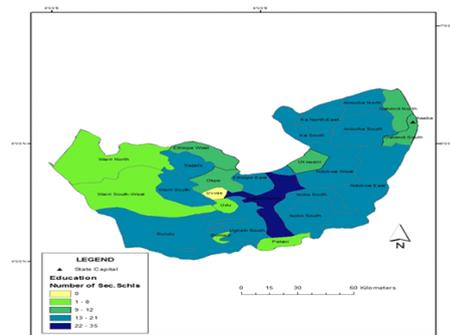
Fig. 5a: Spatial Distribution of Secondary Schools in Delta State
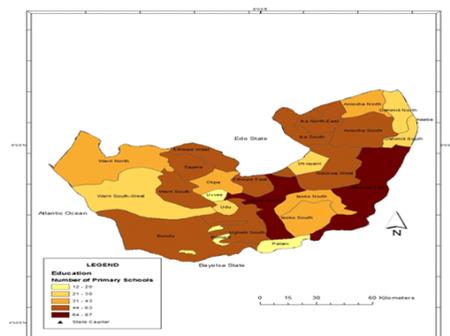
Fig. 5b: Spatial Distribution of Primary Schools in Delta State
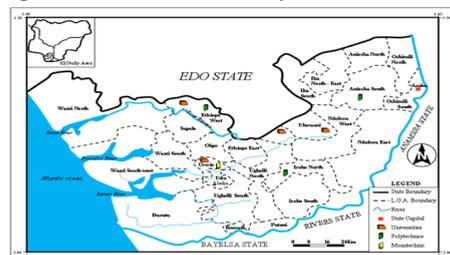
Fig. 5c: Spatial Distribution of Post-Secondary Schools in Delta State

In terms of quantity and complexity of service provided there is a hierarchy of postal services starting from head offices; branch offices and non-cash – accounting postal agencies. Except the last type all other facilities provide financial services to the public. Figure 6 shows the distribution of post offices in Delta State.
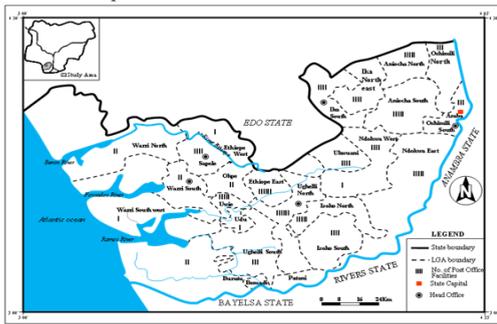
Fig. 6: Distribution of Postal Services in Delta State

Figure 7 represents the distribution of commercial banks in Delta State. There are 123 commercial banks with head offices in Asaba and Warri. The main centres of banking activities are Asaba, Warri, Oshimili South, Ethiope East, Uvwie and Ughelli North Local Government Areas with 63, 11, 7, 7, 10, 6 and 12 regional offices in Asaba and Warri in 2016. The central bank of Nigeria has an office in Asaba, Oshimili South Local Government Area. Commercial Banks was only considered because they have their regional head offices in the study area.

Fig. 7: Map of Delta State showing types of Financial Institutions

Delta State housed over 292 markets. The markets distribution amongst the local government areas are shown in figure 8, these can be grouped into three market categories in this order: 18-26 markets (Ughelli South, Isoko North and Isoko South LGAs), 10-17 markets, (Burutu, Warri South West, Patani Sapele, Okpe, Ethiope East, Ukwani, Ndokwa West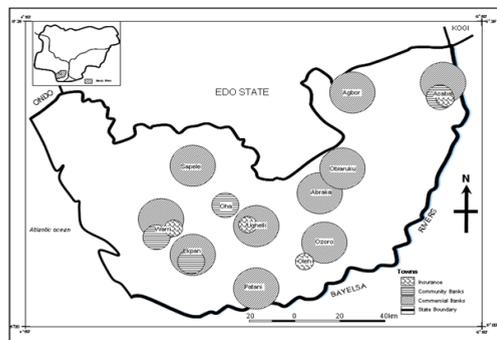, Aniocha North and Ughelli North LGAs) and 0-9 markets (Bomadi, Warri South, Warri North, Ndokwa East, Ika North East, Ika South, Ethiope West, Aniocha South, Oshimili North and Oshimili South LGAs). The daily markets are found in main town and the urban centres of the state (Asaba, Warri, Sapele, Ughelli, Agbor, Oleh, Abraka, etc). These markets serve as collecting centres for goods and services from the neighbouring rural communities. The periodic markets are found in the rural areas of the state, and it usually takes place every four days interval.
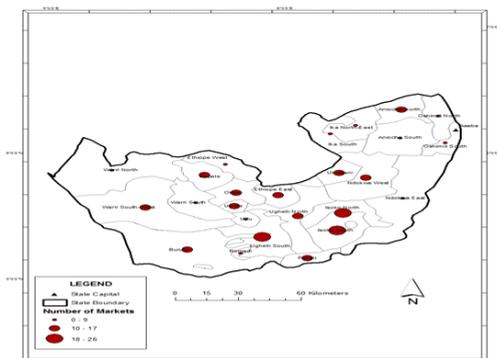

Fig 8: Distribution of Markets in Delta State

The 25 Local Government Councils liaises with the state government to ensure conformity to state regulations and polices. In addition, departments of the various state ministries are located at the Local Government headquarters of the 25 local government areas.

These departments perform functions delegated from the state headquarters as the Local Government Authority derives its revenue from the Federal and State Governments. When a Local Government Headquarter is located in an urban centre, it acquires an urban function, in addition to its normal administrative function, such as control of urban traffic, urban market and other urban utilities.

There are various methods used to classify centres based on central functions. At one extreme are very simple methods such as Christaller's (1933) rank of cities according to the aggregate number of telephone calls, and Grove and Huszar (1964) who suggest differentiating centres on the basis of gross aggregate score of all functions found in a place. Both methods seem unsatisfactory because they do.' not take into account the variety and magnitude of functions in each centre.

Apart from merely establishing a hierarchy of central places, ordering of facilities can be used to construct an index of modernisation as in Soja (1968), Gould (1970), Leinbach (1976), Onakorhoraye (1982 and Atubi 2012c).

In this study since part of the analysis is to relate the level of network accessibility to the occurrence of public facilities, we will construct an index of facility occurrence. In this index construction, the hierarchical ordering of functions is taken into account. Not all functions that may be found in a place are considered. Rather groups of functions have been chosen to reflect as wide a variety of services as possible. These include medical facilities, educational facilities, postal services, banking, market and administrative centres.

The correlation coefficient also tells us the direction of the relationship. If the two data sets vary in the same direction r will be positive, whereas if they vary inversely r will be negative. The r - value ranges from 0 to 1, the higher it is, the stronger the relationship is supposed to be while its significance (whether it is a chance occurrence or not) is tested by means of the t-test. Appendix A and B gives a pair wise correlation matrix of the 13 variables employed in the index construction. The analysis reveals a certain pattern of association. For example it is seen that the occurrence of specialist hospital (X_1) is highly associated with occurrence of post-secondary institution (X_5) and has little association with such variables as secondary schools (X_4), daily markets (X_8), general post office (X_{11}) and non-accounting postal agency (X_{10}). At the other extreme, is the occurrence of dispensaries (X_4) which has negative association with most of the variables. This implies that whereas specialist hospitals, health centres/maternity homes and general hospitals are found in higher order centres, dispensaries are found in lower order centres. However, care should be taken in interpreting the correlation matrix as high correlation coefficient between two variables does not necessarily mean that the occurrence of one will lead to the occurrence of the other. For example, that the high correlation coefficient between specialist hospitals (X_1) and post-secondary institutions (X_5) (r = 0.60) does not mean that occurrence of a hospital, necessarily lead to the occurrence of post-secondary institutions, but it does imply that both tend to be located in the same place within the study area.

From figure 9 and Table 1 we observe that Warri has the greatest value (1390) followed by Asaba (856). These incidentally are centres with very high accessibility. At the extreme, centres with the least indices include Omadino (7) and Ogidigbeu (13). These are centres with low accessibility and low order centres.
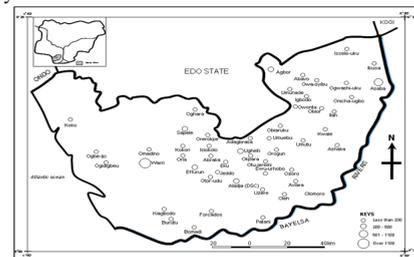

Fig. 9: Map of Delta State Functional Indices of Centres

Table 1: The functional index of facility occurrence in Delta State 2016

S/N	Mode No.	Population 2006 Census	X1		X2		X3		X4		X5		X6		X7		X8		X9		X10		X11		X12		X13		Total Weight
			UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	UNF	WV	
1	Issele-uku	32101	0	0	2	12	1	2	0	0	0	0	5	25	8	8	2	20	2	10	1	5	0	0	1	10	1	10	110
2	Ogwashi-Uku	63080	0	0	2	10	2	4	0	0	1	10	6	30	13	13	2	20	2	10	1	5	0	0	3	30	1	10	142
3	Owa-oyibu	73000	1	10	1	5	3	6	0	0	0	0	2	10	10	10	2	20	2	10	1	5	0	0	1	10	1	10	96
4	Agbor	84020	1	10	10	50	2	2	0	0	2	10	5	25	10	10	9	90	2	10	1	5	1	10	7	70	1	10	302
5	Ashaka	41330	0	0	1	5	0	0	0	0	0	0	1	5	8	8	1	10	2	10	1	5	0	0	0	0	1	10	53
6	Kwale	54064	0	0	1	5	2	2	0	0	1	10	3	15	8	8	1	10	3	15	0	0	0	0	1	10	1	10	85
7	Ibusa	64231	0	0	3	15	0	0	0	0	0	0	5	25	8	8	2	20	3	15	1	5	0	0	1	10	1	10	108
8	Asaba	106020	1	10	15	75	0	0	0	0	2	20	10	50	11	11	40	400	1	5	1	5	1	10	26	260	1	10	856
9	Obiaruku	46231	0	0	3	15	0	0	0	0	0	0	3	15	4	4	1	10	1	5	1	5	0	0	2	20	1	10	84
10	Abavo	23010	0	0	1	5	0	0	0	0	0	0	4	20	8	8	1	10	1	5	1	5	0	0	0	0	0	0	53
11	Umuebu	11091	0	0	1	5	0	0	0	0	0	0	2	10	2	2	0	0	1	5	0	0	0	0	0	0	1	10	22
12	Bomadi	23072	0	0	3	15	1	2	0	0	0	0	2	10	6	6	1	10	1	5	0	0	0	0	0	0	1	10	58
13	Burutu	93224	1	10	4	20	1	2	1	1	1	10	2	10	6	6	1	10	2	10	0	0	0	0	1	10	1	10	98
14	Ozoro	74222	1	10	1	5	1	2	0	0	1	10	3	15	8	8	2	20	1	5	1	5	0	0	4	40	1	10	130
15	Oleh	102701	1	10	5	25	1	2	0	0	1	10	3	15	8	8	2	20	1	5	1	5	0	0	3	30	1	10	140
16	Patani	26021	0	0	1	5	0	0	0	0	0	0	2	10	4	4	1	10	1	5	0	0	0	0	1	10	1	10	54
17	Koko	101232	0	0	1	5	4	8	0	0	0	0	2	10	7	7	1	10	1	5	1	5	0	0	1	10	1	10	70
18	Warri	201642	1	10	70	300	0	0	0	0	1	10	11	55	30	30	60	600	2	10	1	5	1	10	30	300	1	10	1390
19	Ogbe-ijo	88103	0	0	1	5	1	2	0	0	0	0	1	5	3	3	1	10	1	5	0	0	0	0	0	0	1	10	40
20	Ogidigbeu	15021	0	0	0	0	1	2	0	0	0	0	1	5	1	1	0	0	1	5	0	0	0	0	0	0	0	0	13
21	Omadino	23741	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	1	5	0	0	0	0	0	0	0	0	7
22	Uzere	52061	0	0	1	5	1	2	0	0	0	0	1	5	2	2	0	0	1	5	0	0	0	0	0	0	0	0	17
23	Kiagbodo	98201	0	0	1	5	1	2	0	0	1	10	0	0	2	2	0	0	1	5	0	0	0	0	0	0	0	0	25
24	Abraka	86224	0	0	10	50	1	2	0	0	1	10	4	20	7	7	1	10	1	5	1	5	0	0	7	70	0	0	179
25	Oghara	103060	2	20	4	20	0	0	0	0	2	20	6	30	10	10	1	10	1	5	1	5	0	0	3	30	1	10	170
26	Orerokpe	68021	0	0	6	30	0	0	0	0	0	0	10	50	10	10	0	0	1	5	0	0	0	0	2	20	1	10	125
27	Sapele	92101	0	0	10	50	0	0	0	0	0	0	10	50	13	13	8	80	1	5	1	5	1	10	6	60	1	10	283
28	Otor-utu	101221	0	0	3	15	0	0	0	0	0	0	6	30	10	10	1	10	1	5	0	0	0	0	1	10	1	10	90
29	Ughelli	183201	0	0	8	40	0	0	0	0	1	10	10	50	11	11	7	70	1	5	1	5	1	10	5	50	1	10	301
30	Otu-jeremi	104231	0	0	5	25	0	0	0	0	0	0	10	50	10	10	3	30	2	10	0	0	0	0	2	20	1	10	145
31	Effurun	101021	0	0	40	200	0	0	0	0	2	20	12	60	10	10	14	140	1	5	1	5	1	10	15	150	0	0	310
32	Isiokolo	34010	0	0	3	15	1	2	0	0	0	0	2	10	4	4	1	10	1	5	1	5	0	0	0	0	1	10	61
33	Jeddo	16201	0	0	1	5	0	0	0	0	0	0	3	15	2	2	1	10	1	5	0	0	0	0	2	20	0	0	57
34	Oria	18220	0	0	0	0	0	0	0	0	0	0	2	10	2	2	0	0	1	5	0	0	0	0	0	0	0	0	17
35	Eku	241221	0	0	1	5	0	0	0	0	0	0	2	10	2	2	0	0	1	5	1	5	0	0	1	10	0	0	37
36	Aviara	29010	0	0	1	5	0	0	0	0	0	0	2	10	2	2	1	10	1	5	1	5	0	0	0	0	0	0	37
37	Kokori	30071	0	0	2	10	0	0	0	0	0	0	2	10	2	2	0	0	1	5	1	5	0	0	0	0	0	0	30
38	Adagbrasa	19772	0	0	1	5	0	0	0	0	0	0	2	10	2	2	0	0	1	5	5	5	0	0	0	0	0	0	26
39	Aladja (DSC)	31010	0	0	10	50	1	2	0	0	0	0	5	25	4	4	5	5	1	5	1	5	0	0	6	60	0	0	201
40	Ewu/Urhobo	161222	0	0	1	5	1	2	0	0	0	0	2	10	3	3	0	0	1	5	1	5	0	0	0	0	0	0	30
41	Forcados	12990	0	0	1	5	1	2	1	1	0	0	1	5	1	1	1	1	1	10	1	5	0	0	0	0	0	0	34
42	Igbodo	13030	0	0	1	5	0	0	0	0	0	0	1	5	1	1	1	10	0	0	1	5	0	0	0	0	0	0	21
43	Illah	18241	0	0	1	5	1	2	0	0	0	0	2	10	2	2	0	0	1	5	1	5	0	0	1	10	0	0	39
44	Obior	12080	0	0	1	5	1	2	0	0	0	0	3	30	4	4	1	10	1	5	1	5	0	0	0	0	0	0	61
45	Orogun	16209	1	10	1	5	0	0	0	0	0	0	3	30	3	3	0	0	1	5	1	5	0	0	0	0	0	0	58
46	Okpara	41090	0	0	2	10	0	0	0	0	0	0	8	40	10	10	1	10	2	10	1	5	0	0	2	20	0	0	105
47	Olomoro	29330	0	0	1	5	1	2	0	0	0	0	2	10	3	3	1	10	1	5	1	5	0	0	0	0	0	0	40
48	Onicha-ugbo	22410	0	0	1	5	0	0	0	0	0	0	2	10	3	3	1	10	1	5	1	5	0	0	0	0	0	0	38
49	Ononta	16020	0	0	1	5	1	0	0	0	0	0	2	10	3	3	0	0	1	5	1	5	0	0	0	0	0	0	28
50	Umunede	28090	0	0	1	5	1	2	0	0	0	0	4	20	6	6	1	10	1	5	1	5	0	0	2	20	0	0	73
51	Umutu	26220	0	0	1	5	0	0	0	0	0	0	2	10	3	3	0	0	1	5	1	5	0	0	0	0	0	0	28

NNF = Un-weighted number of facilities, WV = Weighted value
Source: National Population Commission and Fieldwork, (2016)

X_1=Specialist hospital
X_2=General + private hospitals
X_3=Health centre + Maternity homes
X_4=Dispensary
X_5=Post-secondary institutions (Universities, polytechnics, colleges of education, etc)
X_6=Secondary school + vocational schools
X_7=Primary schools
X_8=Daily market with lockup stores
X_9=Weekly market
X_{10}=General post office agency
X_{11}=General post office headquarter
X_{12}=Commercial banks
X_{13}=Local government administrative headquarters

Policy Implications

The strategy of constructing new links to improve accessibility may involve heavier financial investment. Thus a proper cost benefit analysis may be needed to determine the desirability of such investment. The map on figure 10 contains some suggested new links to be constructed. They were made primarily on the basis that they will increase the accessibility, reduce cost and time to other centres. For example, it will normally take a traveller going to Warri from Kiagbodo some 107.2 km, but when a direct road is connected linking Warri to Kiagbodo it would definitely reduce cost, time and accessibility will increase. The same thing can be said if other centres like Bomadi to Forcados, Ogbe-Ijo to Kiagbodo and Burutu to Aladja (DSC).

Still another strategy would be to provide those services which centres lack based on extensive surveys of what are available and what are needed. This centre based approach might prove more useful if the people are guided to choose out of their preference.
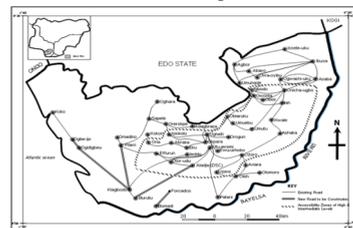
Fig. 10: Suggested Road Improvement Projects
Source: Fieldwork, (2016)

In a pilot survey it was found out in Eku, Ewu-Urhobo, Igbodo, Bomadi and Kiagbodo the major facility the centres desired was a commercial bank while at Ughelli and Umutu it was a specialist hospital. In these centres the nearest commercial bank for Eku is located at Abraka, and for Ughelli the nearest specialist hospital is located at Warri providing them with the facilities would reduce the distance travelled to obtain these services. This suggestion can be achieved by purchasing structures on the ground.

CONCLUSION
It is in recognition of the need for access to facilities that various measures or re-organizations have taken place in Delta State, namely, the local government reform which created 25 Local Government Areas of the state; establishment of rural banking schemes, setting up of neighbourhood schools with its emphasis on deboarding; and finally rural health care delivery system which encourages the establishment of cottage hospitals. Along with these changes are transport improvement projects that have taken place since the creation of the state which is out to improve network accessibility.

Before we can plan for balanced regional development, however, we need to identify with some degree of objectivity the areas of relative disadvantage with regard to the provision of essential infrastructural facilities.

APPENDICES
APPENDIX A
DEVELOPMENT OF HIERARCHY OF CENTRAL FACILITIES

I. Medical Facilities

X_1=   Specialist hospital   Weighting Score = 10
         Attribute
         –Facilities for specialised treatment of diseases such as psychiatry, eye, dental care etc diseases

X_2=   General + private hospitals   Weighting Score = 5
         Attributes
         –Refer cases to specialised/teaching hospitals
         –Absence of specialist in any particular disease

X_3=   Health clinics/health centres +/Maternity homes   Weighting Score = 2
         Attribute
         -Registered nurse/ midwife in-charge

X_4=   Dispensary   Weighting Score = 1
         Attributes
         -Local health assistant in-charge
         -Dispenses drugs
         -Refers cases to health centre or general hospitals

II. Educational Facilities

X_5=   Post-secondary institutions (Universities, polytechnics, colleges of education, technology, Research institutions)   Weighting Score = 10
         Attributes
         -Training in specialised disciplines or profession
         -Institution headed by Vice-Chancellor, Rector or Provost
         -Staff oriented towards research writing or creation of new ideas
         -Age limit for admission is 16 years hence students are considered as adults

X_6=   Secondary (post primary institution)
         (Secondary grammar, vocational/domestic science schools)   Weighting Score = 5
         Attributes
         -Courses are geared towards entry into the tertiary institution or use towards lower level manpower
         -The staff are oriented towards effective teaching;
         -Students are mostly adolescents (11-16 years)
         -Institution is headed by a principal

X_7=   Primary institution   Weighting Score = 1
         Attributes
         -Pupils trained to acquire the 3RS – reading, writing and arithmetic
         -Staff oriented towards general education
         -Age limit for admission is 6 years (that is pupils are generally children)
         -Pupils are still in the custody of their parents

III. Daily Markets

X_8=   Daily markets   Weighting Score = 10
         Attributes
         -Daily openings
         -Lock-up store and upon shades;
         -Supervised by a market master
         -Retail trading especially food items
         -Wholesale trading

X_9=   Weekly market   Weighting Score = 5
         Attributes
         -Weekly opening
         -Lock-up stores and open space sheds
         -Supervised by local government council
         -Retail trading

IV. Postal Facilities

X_{10}=   General post office (Head office)   Weighting Score = 10
         Attributes
         -Automatic telephone exchange
         -Telegraph services
         -Public holiday and weekend openings

X_{11}=	Departmental/Sub-post office	Weighting Score = 5
	Attributes	
	-Letters and parcel acceptance	
	-Telegraph acceptance	
	-Collect mails from the postal agencies	

X_{12}=	Banking facilities	Weighting Score = 10
	No distinction is made between bank branches located at various places. Rather the location of a single banking institution in a particular place is regarded as a high order service	

X_{13}=	Administrative Facilities	Weighting Score = 10
	Local government headquarters. Any local government headquarters located in an urban centre	

APPENDIX B: PAIRWISE CORRELATION MATRIX BETWEEN THE VARIOUS FUNCTIONS

	X1	X2	x3	x4	x5	X6	X7	x8	x9	x10	x11	x12	x13
x1	1.00	0.15	0.07	0.08	*0.60	0.21	0.42	0.37	0.23	0.20	-0.11	0.25	0.40
x2	0.15	1.00	*-0.53	-0.21	0.42	0.24	-0.02	*0.96	-0.16	*-0.64	-0.34	-0.27	0.00
x3	0.07	*-0.53	1.00	0.03	0.00	-0.27	0.02	-0.15	0.30	0.14	0.25	-0.18	0.14
x4	0.08	-0.21	0.03	1.00	*0.59	-0.25	-0.15	-0.07	0.11	-0.19	-0.02	-0.09	-0.01
x5	0.60*	0.42	0.00	*0.59	1.00	0.05	0.48	0.46	0.18	0.15	-0.04	*0.54	0.42
x6	0.21	0.24	-0.27	-0.25	0.05	1.00	*0.66	*0.57	*0.86	0.21	-0.01	0.38	0.47
x7	0.42	-0.02	0.02	-0.15	0.48	*0.66	1.00	*0.76	*0.82	-0.27	-0.12	*0.62	*0.69
x8	0.37	0.96*	-0.15	-0.07	0.46	*0.57	*0.76	1.00	0.03	0.00	-0.07	*0.73	0.33
x9	0.23	-0.16	0.30	0.11	0.18	*0.86	*0.82	0.03	1.00	*0.66	0.36	0.13	*0.73
x10	0.20	-0.64*	0.14	-0.19	0.15	0.21	-0.27	0.00	*0.66	1.00	-0.07	0.25	-0.01
x11	-0.11	-0.34	0.25	-0.02	-0.04	-0.01	-0.12	-0.07	0.36	-0.07	1.00	-0.02	*0.51
x12	0.25	-0.27	-0.48	-0.09	0.54	*0.38	*0.62	*0.73	0.13	0.25	-0.20	1.00	0.37
x13	0.40	0.00	0.44	-0.01	0.42	0.47	*0.67	0.33	*0.73	-0.01	*0.51	0.37	1.00

Note: Figures in asterisks (*) indicate highly significant coefficients.

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