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Geospatial Analysis of Public Water Supply Facilities in Awka Capital Territory, Anambra State Nigeria

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Abstract

Functional public water supply scheme remains an integral part of liveable cities. However, access to functional government water supply scheme has remained elusive in several states including Anambra State. Despite successive efforts on the part of government to mitigate associated problems, the results seem not to be evident yet. This paper examined water supply facilities in Awka Anambra State and its geospatial distribution. Percentage, mean and standard deviation were used to analyze data generated from distributed questionnaire. GPS and ArcGIS (version 10.5) were also used for acquiring coordinates and plotting as well. Quadrat analysis and Kolmogorov Smirnov test were used to determine the geographical distribution of water facilities in the area. The results showed that Government water supply facilities were found to be moribund. Residents depend on water vendors for daily supply or resort to personal wells and boreholes amongst other sources. This translates to proliferation of wells and boreholes as well as residents patronizing sources of questionable quality. Government water supply facilities were also found to be randomly distributed but access to its services is found to be lopsided. The implication of this is that some residents have better access to borehole locations than others. The Awka Capital Territory Development Authority (ACTDA) and the Anambra State Physical Planning Board were enjoined to take up the responsibility of ensuring good planning of the water supply facilities to guarantee access to majority of consumers. This paper also suggests proper reticulation be done to ensure water supply to the nooks and crannies of the study area.

Keywords: Water, Water Supply, Awka Capital Territory, Anambra State, Boreholes

Introduction

Infrastructure services including provision of water amongst others are central to the activities of households and to economic production (Bejar, 2015). This reality becomes evident when these infrastructures are inadequate to meet with the competing demand of increasing population. Major infrastructure failures quickly and radically reduce communities' quality of life and productivity (ANSWSSP, 2015). Provision of infrastructure services to meet the demands of

businesses, households, and other users is one of the major challenges of economic development (Baba and Abubakar, 2015; Bejar, 2015). Tom and Katherine (2003) opined that water supply planning involves conscious efforts in ensuring adequate supply for households and industries at desired quality and quantity. Ezeabasili, Anike, and Okonkwo (2014) stated that water is a natural endowment in Nigeria. But the rational use of water resources still poses problems and challenges in most states of the country. This may be due to poor planning, lack of good management and best practices, despite the huge sums of money allocated for this infrastructure.

Anybody who knew Awka municipality some 20 years ago will definitely see the drastic changes in terms of population explosion. The 1991 population census reported a total of 191,392 people in Awka (north and south combined). In 2006 the population census figure was put at 301,846 (National Bureau of Statistics, 2010). Increase in the number of residential land uses, influx of people from the suburbs and rural areas as a result of the status of Awka as a State capital has attracted Federal Government presence, industries and varied commercial activities, amongst others. There is also an increase in the number of institutions, ranging from tertiary, secondary and primary institutions springing up frequently. Again, the number of markets and commercial land uses are on the increase. The implication of these (if not properly managed) will most obviously result to: enormous pressure on the existing infrastructure such as roads, water supply, electricity, and waste management facilities.

In Awka, the Anambra State capital, access to adequate urban water supply from the State Water Corporation is a serious problem facing the inhabitants. As a result, successive Governments, have made several attempts in the development of new infrastructure and the rehabilitation of existing ones. A typical example was the rehabilitation of Udoka Water supply Scheme (2009), installation of water tank at Aroma, rehabilitation of Amawbia Water Scheme project (2009), among others. One begins to wonder if all these infrastructural facilities are really in place looking at the dearth of the services, they were originally meant to provide all over the State. Secondly, if they are in place, have they actually served the purpose for which they were fundamentally designed to achieve? Also, there has been imbalances in the distribution of urban infrastructure, especially water supply, which has posed a great challenge in the urban landscape as manifested by inaccessibility of water supply facilities respectively. The purpose of this research is to examine the state of water infrastructure and its geospatial distribution in Awka Capital Territory, Anambra State.

Materials and Method

Study Area

During the 1991 process to create new states, Anambra State was established. It is one of the 5 states in the south east geo-political zone and represents a strategic access to the rest of the south-east, and south-south zones of the country from the River Niger end. Anambra State lies north of the coastlands and delta region of Eastern Nigeria. It is bounded in the North by Kogi and Benue States, in the south by Imo and Abia States; in the east by Enugu State and in the West by River Niger~~ia~~ and Delta State. The people are Igbo by tribe and predominantly Christians. Awka was named as the State capital and seat of Government at the creation of Anambra State. Geographically, Awka lies between latitudes 6º09¹N and 6º19¹N and longitudes 7º01¹E and 7º12¹E (Figure 1). Using the 2006 national population census figure of 189, 654 and population growth rate of 2.8%, Awka is projected to have a population of 258, 688 in 2019.

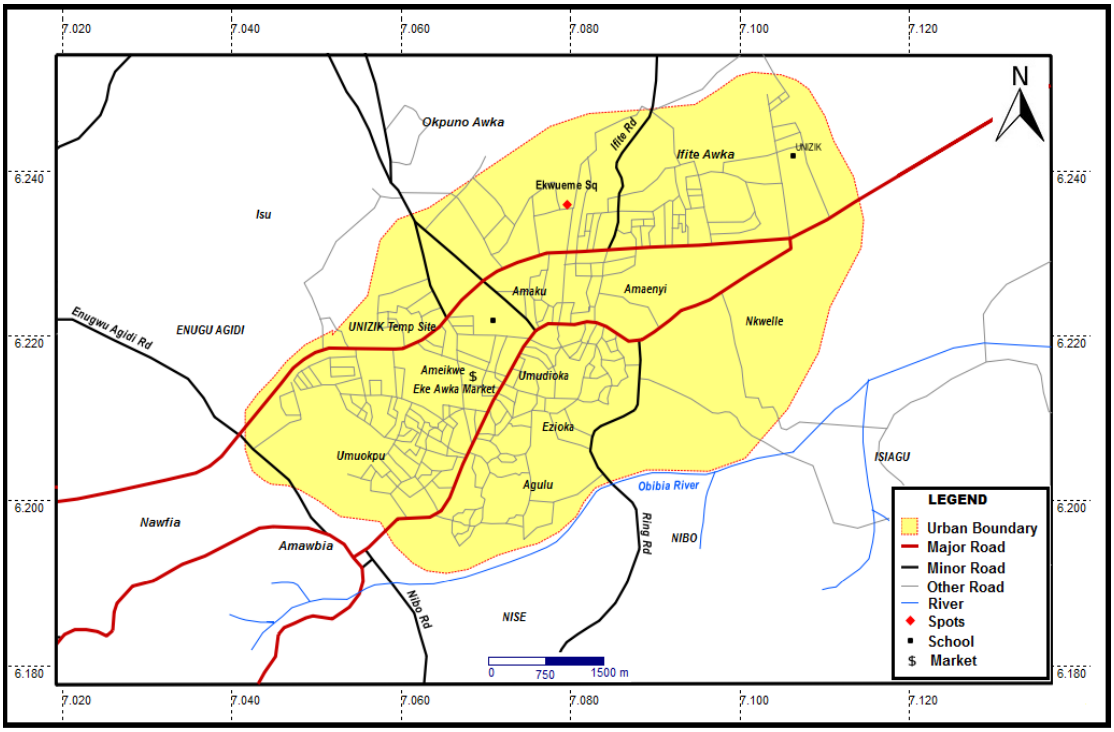

Figure 1: Map of AwkaCapital Territory.

Methodology

A total of 400 copies of questionnaires were randomly distributed to residents in different parts of Awka Capital which include: Amawbia, Okpuno, Eke-Awka, Amaenyi, Amikwo, Amudo, Ifite, Temp Site, Umuayom, and Umuzocha. Structured interview method was used for Government Officials in the water sector. Analysis of data was done using percentage, mean and standard deviation. To determine geographical distribution of water infrastructure quadrat analysis was used through generating a Poisson probability distribution while goodness of fit test was done using Kolmogorov Smirnov test where observed points were converted to proportions. Geographic Positioning System (GPS) was deployed for the collection of coordinates of various water supply facilities while Geographic Information System (ArcGIS10.5) was used to plot the location. The secondary data collected focused on total number of water schemes within the study area, information on Operation and Management (O&M) modalities of water supply infrastructure among other things. The secondary data were sourced from Government establishments, such as: Ministry of Public Utilities, Anambra State Physical Planning Board, Awka Capital Territory Development Authority. Other secondary data sources included; library materials such as journals, conference papers, and textbooks on urban infrastructure renewal.

Results and Discussion

The results obtained are presented in subsequent tables. At retrieval, a total of 392 copies were completed, representing 98 percent response rate (table 1)

Table 1: Distribution of the Response rate of the Questionnaires

Questionnaires	**Frequency**	**Percentage**
Returned	392	98.0%
Unreturned	8	2.0%
Total	**400**	**100.0%**

Source: Author's Survey Report 2020

Socio-Demographic Characteristics of Respondents

Table 2 revealed that more male respondents were reported than females based on the distribution of the questionnaire. From the result, the total number of sampled males in the study was 225, representing 57 percent of the study population while that of females constituted about 167 representing 43 percent. In Table 2, the age group of the respondents were also shown; out of the total number of respondents, 34 percent were between age bracket of 25 – 34 years; 34 percent of the respondents were between the ages of 18 and 24 years; 21 percent had ages ranging from 35 to 45 years; while about 11 percent of the respondents were within the age group of above 45 years of age. The result also showed that majority of the respondents were within the reproductive age group ranging from 18 to 35 years.

On the duration of stay, table 2 revealed how long the respondents lived in the study area. It showed that about 74 percent of the respondents have lived in the area between 0-10 years while the remaining 26 percent have lived in the area for 11 years and above. For the educational attainment of the respondents, the result indicated that all the respondents have varying levels of formal education. A large number of the respondents (58percent) showed that their highest level of education was tertiary education; 34 percent of the respondents attended up to secondary school level; 7 percent of them completed primary education while none of the respondents reported not having any formal education. It is therefore impressive to know that the respondents had one form of formal education or the other and as such understood the contents of the questionnaire.

Table 2: Socio-Demographic Characteristics of the Respondents

Characteristics	**Variables**	**Frequency**	**Percentage (%)**
Sex	Male	225	57.4%
	Female	167	42.6%
	Total	**392**	**100.0%**
Age	18-24	134	34.2%
	25-34	133	33.9%

	35-45	82	20.9%
	45 and above	43	11.0%
	Total	**392**	**100.0%**
Duration of Stay	0-5years	172	43.9%
	6-10 years	118	30.1%
	11-15 years	52	13.3%
	16-20 years	35	8.9%
	21 years and above	15	3.8%
	Total	**392**	**100.0%**
Educational Attainment	No Education	0	0.0%
	Primary School	29	7.4%
	Secondary School	135	34.4%
	Tertiary	228	58.2%
	Total	**392**	**100.0%**
Occupation	Students	64	16.3%
	Civil servant	65	16.6%
	Public servant	45	11.5%
	Trader	111	28.3%
	Artisan	76	19.4%
	Others	31	7.9%
	Total	**392**	**100.0%**

Source: Author's Field Survey 2020

Moreover, the distribution of occupation of the respondents shows that they were mainly traders and artisans, constituting about 28.3 percent and 19.4 percent respectively; followed by civil servants and students constituting about 16.3 percent and 16.6 percent respectively. The least were public servants and others of 11.5 percent and 7.9 percent respectively.

Water Supply Issue and Availability.

Table 3 indicated that majority of the respondents strongly disagreed to most of the assertions made on water availability and supply. It revealed that residents made provision for their own water needs mostly through private boreholes and water supply tanker vendors. They further emphasized that most Government sponsored boreholes were not functional. Hence, the major source of water supply to most families and industries within the study area has been private boreholes and water supply vendors. The respondents also believed that inadequate funding and epileptic power supply must have contributed to the enormous failure of the various water supply schemes/facilities within Awka capital territory. Also, from 2006 till 2017, the respondents acknowledged that status quo has remained despite the supposed renewal efforts in the sector by successive Governments and direct sponsorship by international donors, such as United Nations (Millennium Development Goals), European Union, World Bank among others. Ezeabasili (2014) revealed that to meet their demand for potable water supply, the inhabitants of Anambra State have survived by constructing water supply systems, reservoirs, wells and boreholes. Other residents patronize water vendors and rain water collected from roofs. Proliferation in the use of water from alternative sources, such as shallow hand dug wells and boreholes, water from streams and rivers lead to the utilization of water with questionable qualities for domestic activities. This is not far from the assertion of Anarado et al (2019).

Table 3: Residents' responses on water supply issues and availability in Awka

S/N	Question items	SA	A	D	SD	UD	Statistics	
							Mean	Std.
1.	The major source of water in my family is Government water supply borehole	0	0	245	141	6	2.6	0.519
2.	There is an existing functional Government water supply scheme/borehole in the area.	0	5	246	140	1	2.7	0.509
3.	Government water supply is available to everyone in the area	0	0	272	120	0	2.7	0.461
4.	Government water supply scheme or borehole in the area has improved resident's standard of living	20	15	159	196	2	2.6	0.792
5.	There is need for more water supply scheme in the area	340	40	10	2	0	4.8	0.471
6.	Water supply scheme/borehole greatly improved from 2006-2013	0	38	235	117	2	2.8	0.610
7.	Water supply provision greatly improved between 2014-2020	35	21	226	108	2	2.9	0.840
8.	Government water supply scheme /borehole has been repaired recently	0	28	215	104	45	2.6	0.786
9.	The Government water borehole/scheme in my area is an entirely new project	0	0	249	91	52	2.5	0.719
10.	The Government water borehole	12	14	280	80	6	2.9	0.637

	facilities are still functional							
11.	The Government water borehole facilities have been rehabilitated or repaired within the last 10 years	33	97	179	68	15	3.2	0.941
12	The residents in my location have stopped the practice of digging personal boreholes.	9	11	246	120	6	2.7	0.648
13.	The residents buy water from the water supply tanker vendors	177	123	35	22	35	4.0	1.254
14.	There has been constant power supply for the water supply facility to be functional.	18	70	254	42	8	3.1	0.733
15.	Funding affected the functionality of the water supply scheme in Awka	234	124	20	11	3	4.5	0.783
16.	Residents make use of personal boreholes as their source of water supply	277	105	4	1	5	4.7	0.645
Cluster mean & Std. deviation							**3.2**	**0.709**

Source: Field Survey

Note: SA-Strongly Agreed, A-Agreed, UD-Undecided, SD-Strongly Disagreed, D-Disagreed

From the likert table 4 with a cluster mean value of 4.6 > 3.0 and associated standard deviation of 0.476 < 1.581, affirmed the issues and challenges of water availability in Awka town, particularly, the results showed that while majority of the officials acknowledged the adequacy of the available water supply/borehole scheme, some of the officials strongly agreed that most of the water schemes have not been operational in the past 10years. This failure was attributed to operation and management bottlenecks, which affected service delivery despite foreign direct investments in the water sector. The officials unanimously agreed that the residents have resorted to private provision of water through private boreholes and water tanker vendors. However, despite constant repair of the water facilities, the continuous efforts being made to revitalize the sector and the yearly budgetary allocation, the functionality of the water supply facilities is still uncertain.

Table 4: Officials' responses on water issues and availability in Awka

S/N	Question items	SA	A	D	SD	UD	Statistics	
							Mean	Std.
1.	Water scheme/Borehole projects within Awka are solely Government sponsored	0	0	4	8	0	2.3	0.492

2.	The projects are jointly sponsored by the Government and other partners	4	8	0	0	0	4.3	0.492
3.	The available water supply facilities are sufficient for the needs of the teeming population within the coverage area.	8	0	0	4	0	4.0	1.477
4.	The water supply/borehole facilities have been rehabilitated to ensure efficiency	4	8	0	0	0	4.3	0.492
5.	There are still water supply issues in the area despite the intervention	8	2	0	2	0	4.3	1.155
6.	The water scheme/boreholes are frequently repaired and new equipment replaced	6	0	6	0	0	4.0	1.044
7.	The water scheme/boreholes have been abandoned for the past 10 years	10	0	2	0	0	4.7	0.778
8.	There are operations and management challenges with service delivery	10	0	0	2	0	4.5	1.168
10.	There are also financial challenges in the water sector	12	0	0	0	0	5.0	0.000
12.	Quality control measures are put in place to ensure good water quality	10	2	0	0	0	4.8	0.389
13.	There would have been more industries and investment opportunities if Government water supply was reliable	12	0	0	0	0	5.0	0.000
14.	Government water supply scheme project would have greatly improved the quality of life of the residents	12	0	0	0	0	5.0	0.000
15.	Water supply facilities are in good shape	10	0	0	2	0	4.5	1.168
16.	Water supply situation in Awka is deplorable	10	2	0	0	0	4.8	0.389
17.	Government water supply is non-existent	12	0	0	0	0	5.0	0.000
18.	Efforts are being made towards revitalizing the water supply sector	12	0	0	0	0	5.0	0.000
19.	There is yearly budgetary allocation for water supply scheme/borehole project within Awka.	12	0	0	0	0	5.0	0.000
20.	Personal boreholes are the major source of water in Awka Urban	12	0	0	0	0	5.0	0.000

21.	Tanker water supply vendors are also involved in water supply distribution in Awka urban	12	0	0	0	0	5.0	0.000
Cluster mean and standard deviation							4.6	0.476

Source: Field Survey,

Note: SA-Strongly Agreed, A-Agreed, UD-Undecided, SD-Strongly Disagreed, D-Disagreed

Geographical Distribution of Government Water Supply Facilities

The nature of the spatial distribution of Government water supply facilities was sought. The motivation was to examine whether the observed pattern of distribution of the boreholes were distinctly planned, randomly distributed or has no pattern. In view of this, the statistical technique used was quadrat analysis. The expected distribution was obtained by generating a Poisson Probability Distribution.

The result of the analysis showed the spatial distribution of boreholes in the study area. The total number of Government owned boreholes and MDG boreholes in the study area is approximately 32. The map was gridded and the number of quadrats partially or wholly within the borders of the study area were counted to be 60. The probability of a point in any quadrat was calculated by dividing the number of boreholes in the area with the number of quadrats counted. This yielded a value of 0.5. The observed frequencies for number of points were given in table 5.

Table 5: Summary of Number of Points

Number of Points	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Observed	**45**	**8**	**6**	**1**	**0**	**0**	**0**	**1**

Source: Author's field survey computation

The expected frequencies were obtained by generating a Poisson distribution and these are as shown in table 6.

Table 6: Poisson distribution of Boreholes and the Expected Frequencies

Number of Points	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Poisson	0.6065	0.3032	0.0758	0.0126	0.0016	0.0002	0.00001	0.0000
Observed	45	8	6	1	0	0	0	1
Expected	36.37	18.19	4.548	0.756	0.096	0.012	0.0006	0.0000

Source: Author's field survey computation

A goodness of fit test was performed using Kolmogorov – Smirnov test. Here, the number of points were converted into proportions i.e., observed and expected proportions. The result of the goodness of fit is shown in table 7.

Table 7: Goodness of Fit Table

Number of Points	0	1	2	3	4	5	6	7
Observed	0.75	0.133	0.1	0.0167	0	0	0	0.0167
Expected	0.606	0.303	0.076	0.0128	0.0016	0.0002	0.00001	0.0000
Cumulative Proportions								
Observed	0.75	0.883	0.983	0.9997	0.9997	0.9997	0.9997	1.000
Expected	0.606	0.909	0.985	0.9978	0.9994	0.9996	0.9996	0.9996
Difference	0.144	-0.026	-0.002	0.0019	0.0003	0.0001	0.0001	0.0004

Source: Author's field survey computation

From the table of Kolmogorov – Smirnov goodness of fit, the maximum difference (Max D) is 0.144. At 0.05 confidence level, the critical D was calculated to be 0.175. Maximum D of 0.144 < 0.175. This implies that the distribution of boreholes in the study area by the State Government were random. Imperatively, there is no pattern in the distribution of boreholes within the study area. This random distribution of boreholes agreed with the respondents' opinion on the challenges of poor accessibility to water supply source. Consequently, many consumers relied on any accessible source of water in order to avoid the long-distance trekking in search of Government water supply facility. The irregular location of the few available and potential sources of water has added to the number of inadequate urban amenities and services in Awka urban area, making it one of the amenities that contribute to dysfunctional urban development process (Ezezue, Ezenwaji and Odoanyanwu, 2017).

Importantly, the existing water supply facilities ought to be fully reticulated in order to reduce the problem of long-distance trekking. Apparently Figure 4, revealed that the boreholes were mainly situated within a few districts such as Ifite, Okpuno, Ngozika and Amawbia axis which was acknowledged in Ezezue, Ezenwaji and Odoanyanwu (2017) to be as a result of the rate of developments taking place at these locations. Nonetheless, the planning of the water supply facilities/ boreholes should be as regular as possible to address the water needs of the residents of the entire Awka Capital Territory. It is advocated here in line with the submission made by Ezezue *et al.* (2017) that in areas where regular citing may not be feasible as a result of geological and environmental factors, reticulation of the available ones should be carried out to improve easy accessibility. Although, the field interview conducted revealed that Greater Awka water supply scheme and Amawbia borehole field were fully reticulated. For instance, Greater Awka water supply scheme transmits water to the water facility located at Aroma (Aroma Tank), the water facility therefore reticulates to other parts of Awka urban like Government House and St. Thomas Aquinas Catholic Church axis. Also, Amawbia borehole field transmits water into Amawbia-Ugwu Tank, where it's reticulated to various communities in Amawbia even down to Umuokpu. However, all the pipes were non-functional, physical observation revealed various points of leakages thereby compromising the entire system.

Figure 2: Water supply reservoir at greater water supply scheme, Commissioners Quarters Awka.

Figure 3: Water supply reservoir at greater water supply scheme, Awka. (With damaged reticulation pipes)

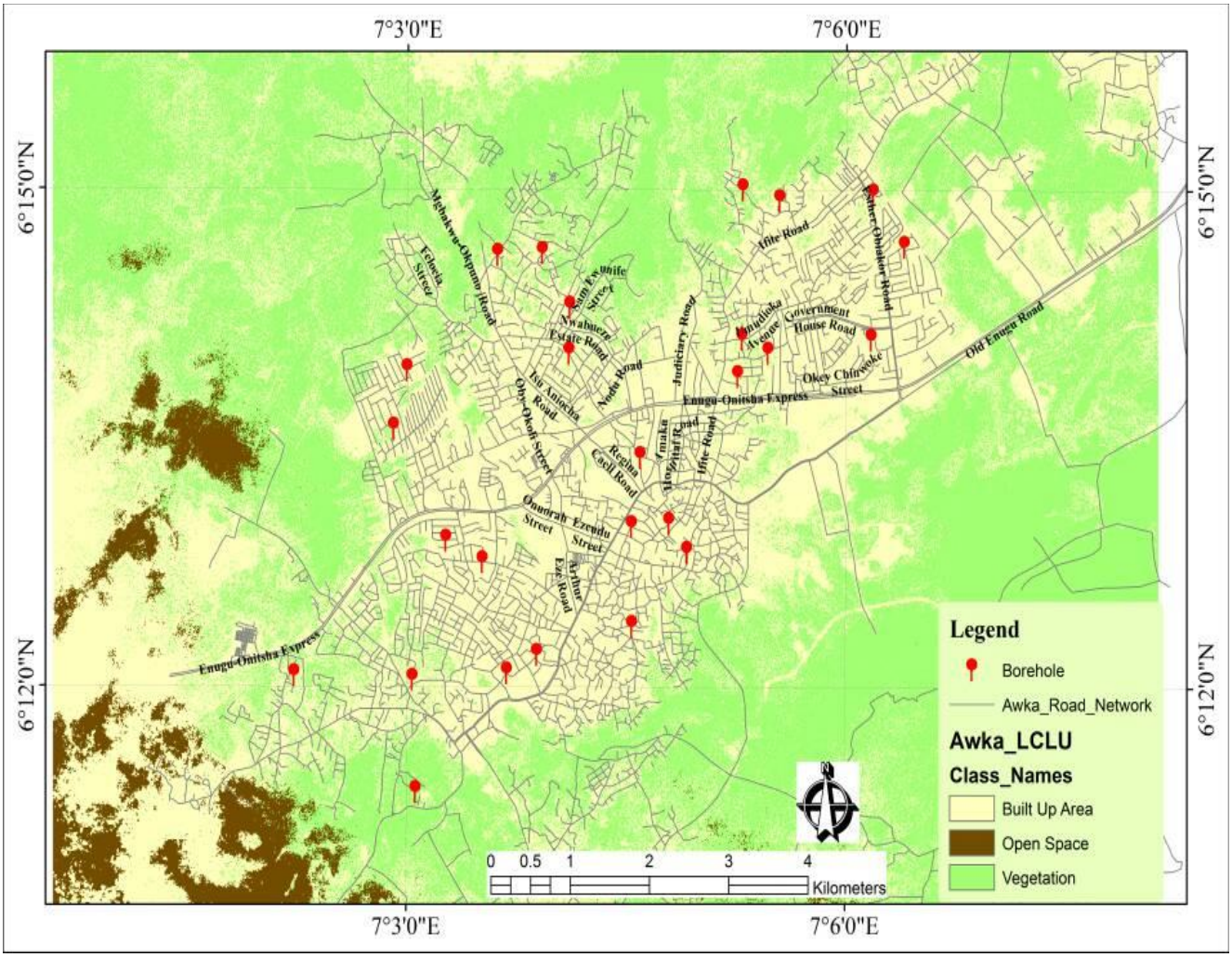

Figure 4: Map of Awka showing the distribution of Government Water facilities

Source: GIS Lab. Department of Surveying and Geoinformatics, Nnamdi Azikiwe University

Table 8: Geographic Location of Water Facilities in Awka Urban Area

S/N	Location	Description	Latitude (Northings)	Longitude (Eastings)	Elevation (m)	Remarks
1	**Aroma tank**	Water facility (Tank)	$06^{o}13.758^{1}$	$07^{o}05.121^{1}$	145m	Functional, reticulated to other parts of Awka and fully equipped
2	**Ifite 1st Mkt**	1 No. borehole	$06^{o}14.080^{1}$	$07^{o}05.185^{1}$	136m	3 fetching points, not reticulated
3	**Commissioner's Quarters**	Water scheme	$06^{o}14.883^{1}$	$07^{o}05.862^{1}$	57m	Reticulated functional and fully equipped
4	**Real Estate**	1 No. borehole	$06^{o}13.793^{1}$	$07^{o}05.332^{1}$	135m	Functional but for power outage
5	**Secretariat**	1 No. borehole	$06^{o}14.170^{1}$	$07^{o}05.022^{1}$	126m	Not functional
6	**Alex Ekwueme**	1 No. borehole	$06^{o}14.059^{1}$	$07^{o}04.848^{1}$	132m	Functional but for power
7	**Aroma ABS/Fly-over**	2 No. borehole	$06^{o}13.743^{1}$	$07^{o}04.808^{1}$	142	Partially equipped with a non-functional mini booster pump
8	**Kwata ADP/Flyover**	1 No. borehole	$06^{o}13.171^{1}$	$07^{o}03.662^{1}$	80	Functional with 4 fetching points
9	**Iyi-Agu Senior Staff Quarters**	1 No. borehole	$06^{o}13.245^{1}$	$07^{o}03.645^{1}$	78	Functional rehabilitated fully reticulated
10	**Iyi-Agu Junior Staff Quarters**	1 No. borehole	$06^{o}13.271^{1}$	$07^{o}03.519^{1}$	96m	Functional but for power fully reticulated
11	**Udoka Housing Estate**	2 No. borehole	$06^{o}12.860^{1}$	$07^{o}03.336^{1}$	100m	Fully furnished but lack Maintenance & Operation

12	**Amawbia Fly-over**	1 No. borehole	06°11.394[1]	07°03.402[1]	78m	Not functional but has 5 fetching point
13	**Rockland**	Water tank	06°13.448[1]	07°02.788[1]	67m	Not functional
14	**Amaku Teaching Hospital**	2 No. borehole	06°13.669[1]	07°04.751[1]	141m	Functional, has water storage tank with mini booster pump
15	**Amawbia borehole field**	7 No. borehole Water scheme	06°11.394[1]	07°03.402[1]	98m	Functional, well reticulated to about 20 fetching points
16	**Okika water spring**	Natural water	06°11.568[1]	07°03.544	84m	Desolated
17	**Igwebuike Sec. School**	1 No. borehole	06°12.886[1]	07°04.204	100m	Functional
18	**St. John of God Sec. School**	1 No. borehole	06°13.164[1]	07°04.326	107m	Functional
19	**St Mary's Ezinator School**	1 No. borehole	06°11.629[1]	07°04.049[1]		Functional and fully equipped
20	**Ugwu tank**	Water tank and other facilities	06°11.858[1]	07°02.706[1]	139m	A big tank reticulated and connected to virtually all the villages in Amawbia and Umuokpu. But not fully functional
21	**Ezigu Square Amawbia**	Water tapes	06°11.892[1]	07°02.690[1]	133m	Not functional
22	**Old NYSC**	Handheld pump	06°12.004[1]	07°02.815[1]	129m	Not functional
23	**Amawbia Mkt**	1 No. borehole	06°11.719[1]	07°03.326[1]	109m	Functional
24	**Amawbia PHC**	1 No. borehole	06°12.029[1]	07°03.052[1]	121m	Functional
25	**Girls Sec. School Awka**	1 No. borehole	06°13.523[1]	07°05.167[1]	144m	Not functional

26	**Udeozo School**	1 No. borehole	06°13.514[1]	07°05.088[1]	139m	Not functional
27	**Ayomn'okpala**	1 No. borehole	06°12.969[1]	07°04.917[1]	139m	Skeletal
28	**Central School**	Solar borehole	06°12.370[1]	07°04.194[1]	102m	Functional
29	**Practising School**	Solar borehole	06°11.763[1]	07°04.005[1]	89m	Rehabilitated with additional borehole installed
30	**St. Matthew**	Solar borehole	06°11.748[1]	07°03.227[1]	120m	Functional
31	**Kenneth Dike**	1 No. borehole	06°12.532[1]	07°03.464[1]	95m	Functional
32	**Udoka Primary School**	1 No. borehole	06°13.785[1]	07°03.162[1]		Functional
33	**Community Sec School Okpuno**	1 No. borehole	06°13.824[1]	07°03.879[1]	97m	Functional

Source: Author's field survey.

Conclusion

The importance of safe water supply to man's continued survival on earth cannot be over emphasized. This paper examined the functionality of Government water supply facilities. It was emphasized by majority of the respondents that most Government sponsored boreholes were not functional. It revealed that residents made provision for their own water needs mostly through private boreholes and water supply tanker vendors. This paper also analysed distribution of water supply facilities in Awka. The analysis showed that the distribution of government boreholes in the town was randomly distributed in the study area. This paper therefore recommends that the urban planning authorities namely: Awka Capital Territory Development Authority (ACTDA) and the Anambra State Physical Planning Board should without delay take up the responsibility of ensuring good planning of the water supply facilities to guarantee access to majority of consumers. This paper also recommends proper reticulation be done to ensure water supply to the nooks and crannies of Awka Capital City.

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