Assessment of Water Supply and Management in an Urban Area of Southern Nigeria

Ansa, Iniubong Etim and Uzoma, Evan Ifeoma
Department of Geography and Natural Resources Management, University of Uyo, Uyo. Akwa Ibom State, Nigeria

Abstract
This study assessed water supply and management in an urban area in Southern Nigeria with the aim of identifying the sources of water distributed in the urban area. It evaluated the determinants of water consumption in the study area. To achieve these objectives, a wide range of methods such as semi-structured interviews and structured questionnaires were employed. Through the use of the structured questionnaires, data were obtained through the random sampling of 360 households along three major zones selected for the study in Uyo Urban. The hypothesis for the study was tested using Pearson Product Moment Correlation. The results indicated that there exist a significant relationship between income and the quantity of water consumed per litre per household per day. This is rooted in the fact that improved water supply will reduce the financial resources currently expended in water and water related problems. The study recommended that efforts should be made by policy makers, water agencies and stakeholders in the water sector to ensure that water is available, accessible and affordable in Uyo Urban so as to improve both the quantity and quality of water supplied.
Keywords: water supply, management, urban area, determinants, Nigeria
DOI: 10.7176/JEES/9-5-09
Publication date:May 31st 2019

1.1 Introduction
Beside air, water is one of the most important resources needed by man and man can survive longer without food than without water. Water sustains both life and livelihood. Water is also the basis of all ecological resources for flora and fauna of our earth and a fundamental necessity for human life (Eddy and Ekop 2007). Water is an indispensable component of the human body. Not only is it required for consumption by humans and animals, it is also required for personal hygiene needs such as washing, bathing, sewage and general cleaning. It is also essential for agricultural and industrial productions. The availability of water supply influences the socio-economic and development factors of the world. This informed why reference is frequently made to the interdependency between water and economic development (NEST 1991). Thus, inadequate access to water and sanitation services can contribute to urban poverty just as well managed and improved access to water resources can also contribute to socio-economic development.

Sevaral studies (WHO\UNICEF 2000 and UN-HABITAT, 2005) have established the links between inadequate access to water supply and associated poverty entrapment, increased risk of diseases and reduced livelihood opportunities. Most of these studies hypothesised an inceasing imbalance between the avalaibilty of and demand for fresh water. The marked disparity between developed and developing Countries is the concern for and dominance of water in everyday life is a case in point. Whereas the developed Countries have attained high level of security in water supply and distribution, literature on the developing Countries is replete with dissappointing stories of inaccessibility and irregular supply (White, Brandley, and white 1972; Faniran and Ojo, 1980). In modern times, sustainable economic development is seldom possible without adequate development of water resources to support food production. Even amiss an apparently substantial supply of water at national and regional levels,there may still be sub-regions experiencing serious scarcity. Water crisis is thus a critical issue for government and societies worldwide. Water scarcity affects all urban poor households, but the burden is mostly felt by women and children. Poor women expend large amount of energy and time fetching water which is often of poor quality. This has consequences in terms of human development.

In Uyo Urban, the challenges of water faced by people cannot be overemphasised.These problems which cut across seasonal variation in ground water aquifer, the inability of Government to provide for water needs of the people, insufficient quantity of water supply by private and public driven boreholes and the number of public, private water owners to satify the demand of household users, agricultural purposes and industrial needs have remained contending issues in the overall problem of water supply and management. This is the main reason for this study. This study will contribute to the global discourse on this issue in Nigeria by critically assessing the water supply and management strategies in Southern Nigeria using Uyo Urban as a case study.

1.2 Research Objective
The main objective of the study was to assess water supply and management strategies in Southern Nigeria using Uyo Urban as a case study.

2.1 Conceptual Framework
The Concept Of Hydrological Cycle

The hydrological or water cycle is a gigantic distillation and distribution system. The concept envisages how solar energy and gravity continuously move water from the oceans to the atmosphere, from the atmosphere to the land and oceans, and from the land back to the ocean. The cycle consists of the input, output and storage units. With this system, it means that no water is lost or gained but rather, its transferred from one location to another by these processes namely, evapo transpiration, condensation, precipitation, infiltration, percolation, and runoff, (Pryde, 1973). Water evaporates into the atmosphere from the oceans, lakes, rivers, soil and plants and eventually cools and precipitates as free water, falling either onto land or back in the oceans, rivers and lakes.

By the framework of this concept, water input and output within Uyo Urban can be study to give knowledge on the distribution of water as well the supply of water to the people. Uyo Urban has two sources of water within the state, these are rainfall and river, together with related streams and tribuetries. Water from rainfall far exceed other sources, each year water from rainfall are disposed by: evapotranspiration, storage in lakes and ponds, storage in the ground as groundwater and flow into rivers. These debit items of the water budget as well as the credit items mentioned earlier are linked to form the hydrological cycle by which water keeps moving from the atlantic ocean to the land and back again. Data of this nature (the main items of our water budget) are necessary for sound planning, provision and management of water resources (Ansa, 2006). The Concept of Hydrological Cycle works by certain processes namely: infiltration, runoff, and percolation. Infiltration is the process of water entry into the immediate soil surface and subsequently move vertically downward. Infiltration influences ground water recharge and in turn affects the quality since it is an aspect of the groundwater purification processes. Runoff comprises the gravity movement of water over the surface of the earth in channels of varying sizes. It is variously referred to as stream flow, stream or river discharge of catchments yield. Based on these facts, it is pertinent to state that groundwater runoff represents the main longterm component of total runoff and may be particularly important during long dry spell when rainfall and consequent surface runoff are absent. The concept of hydrological cycle is important because it is a framework for which water resources of a place can be assessed which in turn will determine the supply, naturally water is distributed over the surface of the earth, humans demand for water either for industrial use or domestic has made efforts in exploration and exploitation of the water distributed.Therefore, for any successful study in water distribution and management strategies to be achieved, a proper understanding of the hydrological cycle concept is very necessary.

3. Methodology
3.1 Study Area

Uyo is found approximately between latitude $4^o 52^1$ and $5^o 01^1$ N and Longitude $7^0 47^1$ E and $8^0.03^1$ E of the Greenwich meridian. It covers a land area of about 296km. Uyo functions effectively as a city centre and the state capital of Akwa Ibom State. It is central to other Local Government Areas and almost equidistant and easily accessible from all the other parts of the state. Also, the area is located on an elevation of about 60.96 metres (2090ft) above sea level.
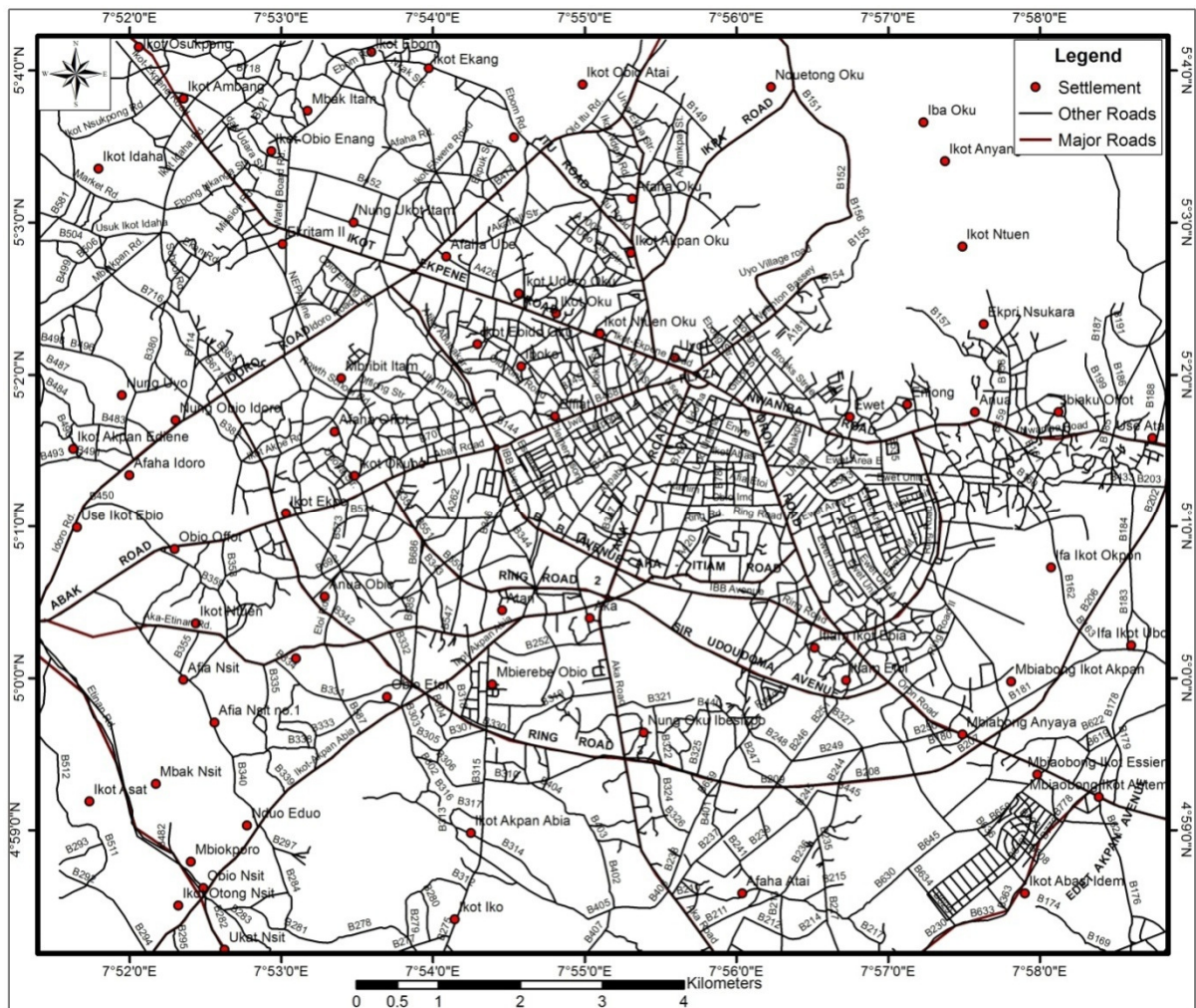
Figure 1: Uyo LGA showing Study Area
Source: Ministry of Lands and Town Planning, Akwa Ibom State. (2019)

The area consists of level-to-gently undulating sandy plains where rivers are few and far between. Shallow depressions contain seasonal lakes that serve as sources of rural water supply in many area. Agriculture and the road network are also adversely affected. Soil erosion has intensified considerably especially where gullying takes place. The drainage network in the upland part of Uyo is not dense, as rivers are few and distant apart with wide interfluves. Only one major river, the Qua lboe River, traverses the entire State from north to south. A major tributary of the Cross River, the Enyong Creek, drains the highly dissected terrain in Ikono, Ibiono and ltu.

3.2 Sampling Method

For the purpose of data collection, Uyo Urban was purposely divided into three major zones vis-à-vis zone A (covering major streets along Ikot Ekpene Raod and Wellington Bassey way), zone B (covering major Roads along Aka Road and Abak Road) and zone C (covering major road along Nwaniba and Oron Road). These axes cover notable roads and streets as earlier mentioned. In each of the zones, 133 questionnaires were administered to households along the streets, hereby bringing the total number of the households selected and interviewed for the study to 399. This was done to enhance representativeness. Random sampling techniques with interval of 3 households were employed in the questionnaire administration. The technique was applied because of the relative homogeneity of the households.

The study subscribed to the tradition of interviewing household heads but other household members were allowed to provide relevant information which could not be adequately supplied by the head of the households. Five households from each of the zones were randomly selected for interview which brought the total number of household interviewed the fifteen. The interview sought to extract more information on the determinant of water consumption based on gender, household size, educational status, marital status and income level.

3.3 Methods of Data Analysis

The study adopts both descriptive and inferential approach of data analysis. The descriptive approach involves

the use of table, figures, charts, simple percentage and arithmetical mean in the data analysis. The inferential statistics include the use of Pearson's Product Moment Correlation in the analysis of the data formulated for the study. It is statistically expressed as:

$$r = \frac{n. \sum xy - \sum x. \sum y}{\sqrt{n. \sum x2 \, (\sum x).^2}\sqrt{n. \sum y2 \, (\sum x).2}}$$

Where; r = Correlation co-coefficient, x = Independent variable, y = Dependent variable

3.4 Ethical Considerations
Certain ethical issues were considered in this study. Firstly, the respondents in the survey were voluntary respondents; there was no use of force or threats to get information. The questionnaires were designed in such a way that a letter of introduction of the study and researcher preceded the questions. The letter showed the identity of the researchers, as well as the intendment of the research, leaving the participant with the choice to either answer the questions or decline. In order to guarantee confidentiality, the questionnaires were designed in such a way that the respondents did not indicate their names and specific addresses but community names were used. The questionnaires were designed in such a way that options or possible answers were presented to the respondents to choose from and tick as appropriate.

4. Data Presentation and Analysis
4.1 Demographic characteristics of respondents
Table 1: Sex of respondents

SEX	Zone 1	Percentage	Zone2	percentage	Zone3	Percentage
Male	97	72.9	78	58.6	71	53.4
Female	36	27.1	56	41.4	64	46.6
TOTAL	**133**	**100**	**133**	**100**	**133**	**100**

Source: Researchers Field Data (2019)

Table 1 showed that the percentage of males sampled in zones 1, 2, 3 is greater than that of females in each of the zones. Zone 1 has a greater percentage of males sampled than the other zones.

Table 2: Marital status

Marital status	Zone 1	%	Zone 2	%	Zone 3	%
Single	38	28.6	36	27.1	40	30.1
Married	61	45.9	81	60.9	69	51.9
Widowed	77	57.9	8	6.0	18	13.5
Divorced	7	5.3	8	6.0	7	5.3
Total	**133**	**100**	**133**	**100**	**133**	**100**

Source: Researchers Field Data (2019)

Table 2 showed the marital status of the sampled population. The married percentage in all the zones are more than the single, widowed then the divorce. It can be observed that the married population consumed more water than the singles, widows and divorced.

Table 3 : Age Distribution

Age (years)	Zone 1	Percentage	Zone 2	Percentage	Zone 3	%
15-21	-	-	4	3.0	-	-
22-35	59	44.4	52	39.1	59	44.4
36-60	59	44.4	69	51.9	67	50.4
61above	15	11.2	8	6.0	7	5.3
TOTAL	**133**	**100**	**133**	**100**	**133**	**100**

Source: Researchers Field Data (2019)

Table 3 showed the age distribution of the sampled population. The age of the sampled population showed that most of the individuals sampled fell within the age group of ages 36-60 with 51.9 per cent in Zone 2, then 50.4 per cent in Zone 3 and 44.4 per cent in Zone 1. The 22-35 age distribution is next with 44.4 per cent in Zones 1 and Zone 3 and 39.1 per cent in Zone 2, then 61 and above and the 15-21 age distribution. Therefore the population sampled were mostly the productive, independent and vibrant, which showed that the 36-60years and the 22-35 age distributions consume more water than the others. Hence, the management of water is mostly done by the population.

Table 4: Occupational status

Occupation	Zone 1	Percentage	Zone 2	Percentage	Zone 3	%
Farming	4	3.0	4	3.0	14	10.5
Trading	39	29.3	52	39.1	58	
Artisan	43	32.3	24	18.0	17	12.5
Civilservant	39	29.3	49	36.8	33	25
Others	8	6.0	4	3.0	10	7.5
TOTAL	133	100	133	100	133	100

Source: Researchers Field Data (2019)

Table 4 indicated that a greater percentage of the sampled population are gainfully employed while those with others are either students, unemployed or seasonal workers. Zones 3 and 2 have a greater percentage of traders and civil servants while Zone 1 had a greater number of artisans. The farming population were less. This showed that these individuals who were employed will have the ability to purchase water as needed and thereby the level of management of water may also be low compared to those who were students, unemployed or seasonal workers.

Table 5: Household size

Household size	Zone 1	Percentage	Zone 2	Percentage	Zone 3	Percentage
1 only	24	18.0	30	22.6	12	9.0
2-4	75	56.4	59	44.4	68	51.1
5-8	30	22.6	30	22.6	49	36.8
9above	4	3.0	14	10.5	4	3.0
Total	133	100	133	100	133	100

Source: Researchers Field Data (2019)

Table 5 showed that the household size in most of the sampled population there are more households with 2-4 household size, then 5-8, 1 only and 9above. The highest number of persons was 2-4 in Zone 1 with a percentage of 75 per cent and then zone 3 and 2. The household size showed that in Zone 1,2 and 3 there were more individuals with an average family size while the individuals with family size of 1only were individuals who are mostly single or students and this population were more in zone 2 while those with family size of 9 and above may be low income earners who could not afford a semi-detatched or detatched house and as a result were crowded in their households. The greater the family size, the greater the consumption of water while the lower the family size, the higher the management of water.

Table 6: Educational status

Educational Status	Zone 1	Percentage	Zone2	Percentage	Zone 3	%
Noformal education	7	5.3	4	3.0	10	7.5
Primary school	30	22.6	24	18.0	30	22.6
Secondary school	43	32.3	39	29.3	46	34.6
University	46	34.6	62	46.6	43	32.5
Others	7	5.3	4	3.0	4	3.0
TOTAL	133	100	133	100	133	100

Source: Researchers Field Data (2019)

Table 7: Income level of respondents

Incomelevel (N)	Zone1	Percentage	Zone2	Percentage	Zone3	%
Under10 000	4	3.0	10	7.5	10	7.5
10000-20000	21	15.8	21	15.8	46	34.6
20000-30000	8	6.0	10	7.5	17	12.8
3000040000	45	33.8	24	18.0	17	12.8
40000above	55	41.2	68	51.1	43	32.2
TOTAL	133	100	133	100	133	100

Source: Researchers Field Data (2019)

This table showed that the highest earning people in Zone 1 and Zone 2 earned between 40000 and above while in Zone 3 a greater percentage of the sampled population earned an income of between 10000 and 20000naira per month. Therefore, we had more high income earners in zone 1 and 2 than in Zone 3 where we have more low income earners in Uyo Urban. Therefore, the amount of money spent on water by sampled households in the different zones will vary based on their income level and this factor may also influence their choice of water supply.

Sources of Water Supply
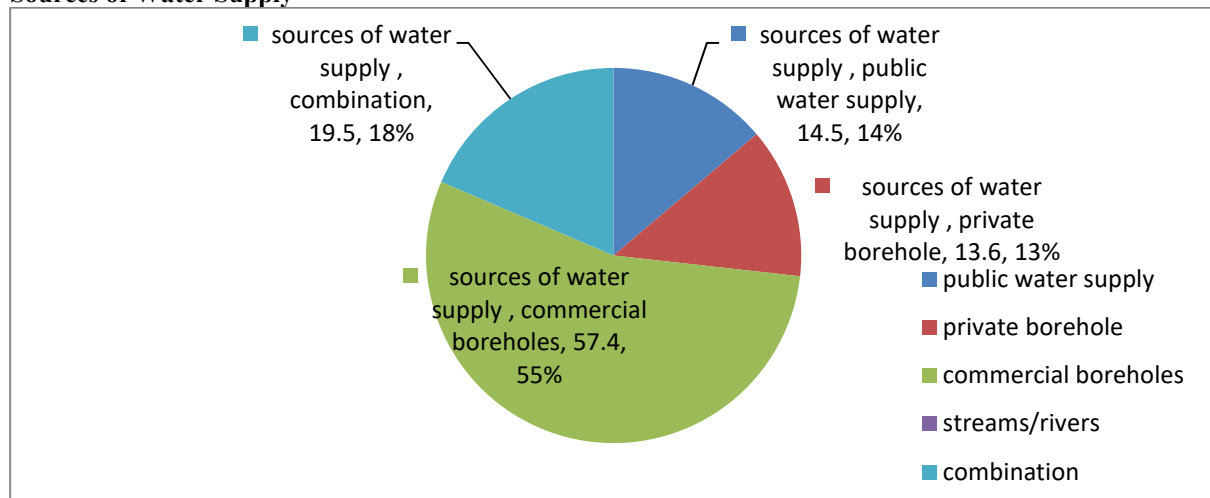

Figure 2 - Sources of Water Supply

From figure 2, the bulk of water in Uyo Urban is from commercial boreholes which accounted for 57.4%. households. Households that obtained their water from both the private water supply made up 19.5% and those that entirely use public water scheme account for 14.5% and 13.6% is from private owned boreholes. This showed that a large percentage of the population purchased their water since it was mostly obtained from commercial boreholes.

Access to Water Supply
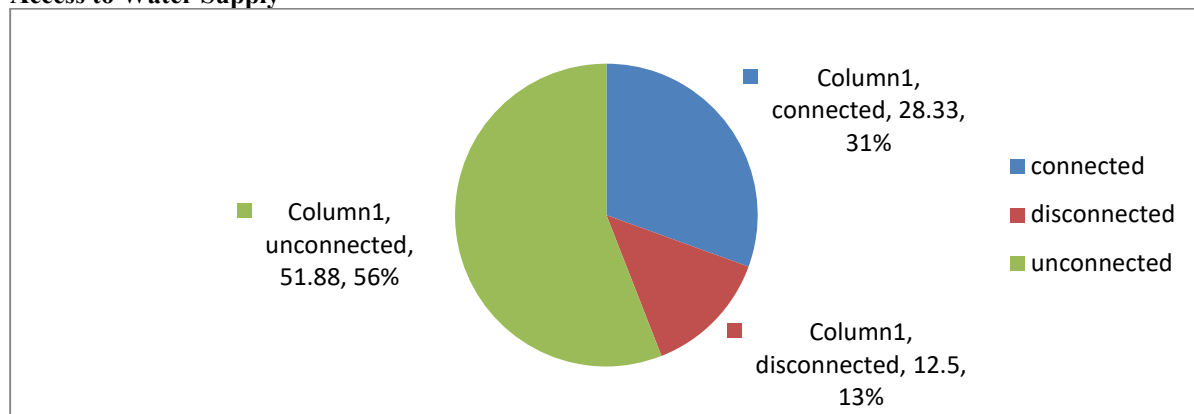
Figure 3 - Access to Public Water Supply

Figure 3 showed that in the three zones 51.88 percent of the sampled population were unconnected or have no access to the public water supply, 28.33 percent were connected and 12.5 percent were disconnected. The unconnected or disconnected houses may be as a result of destruction of pipelines during road construction, power outages or the fact that the house owners cannot afford the cost of connection or their lack of interest in water connection .
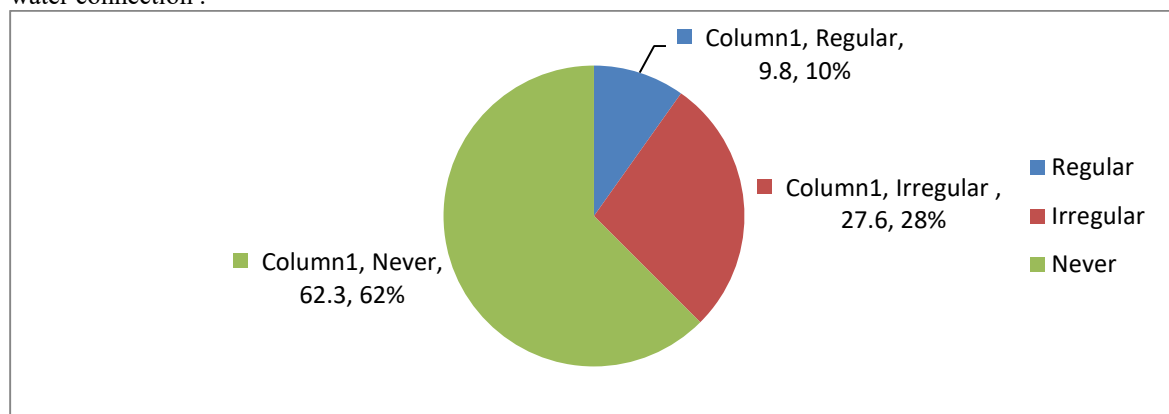

Figure 4 - Regularity of Water Supply

From the figure 3, we observed that 62.3 percent of the sampled population have never used the public water supply, while 27.6 percent who had access do not use the public water supply regularly as a result of some factors such as power outages, broken or damaged pipelines, inabilty on the part of the government to distribute water to such households. The 9.8 percent who had water regularly from the public water scheme were mostly those whose distance from the water source was close.
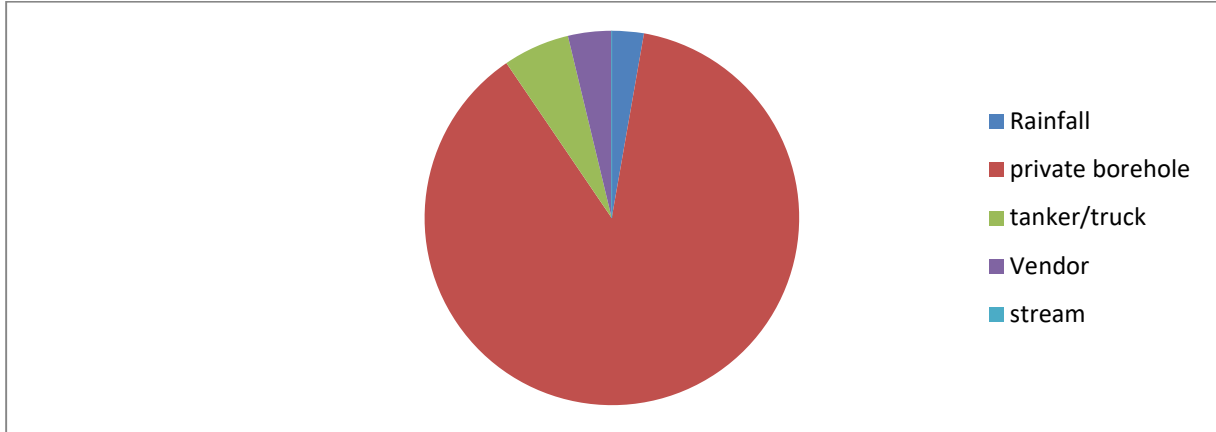
**Figure 5 -Alternative Sources of Water Supply**

Figure 5 showed the alternative sources of water supply with 87.72percent of the respondents using borehole water supply as an altrenative source of water supply, while 5.76 percent obtained their water sourcesfrom tankers and trucks and 3.76 percent from water vendors. The remaining 2.76 percent account for rainfall as an alternative, this was because it is a seasonal source of water supply, although there were other respondents who may use rainfall during the rainy season.

Water Consumption Pattern
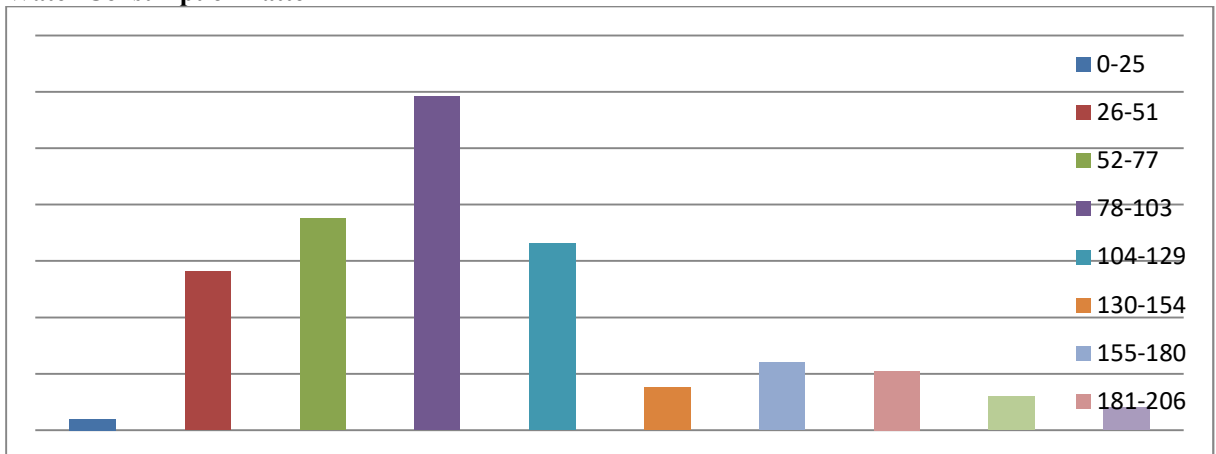
Figure 6 - Water Consumption Pattern

From Figure 6, 29.57 percent of the sampled population consumed between 78-103 litres of water daily while 18.80 percent consumed between 52-77 litres of water daily. The figures showed a high ration of water conservation and management. This was because the more water they consumed the more money they paid.
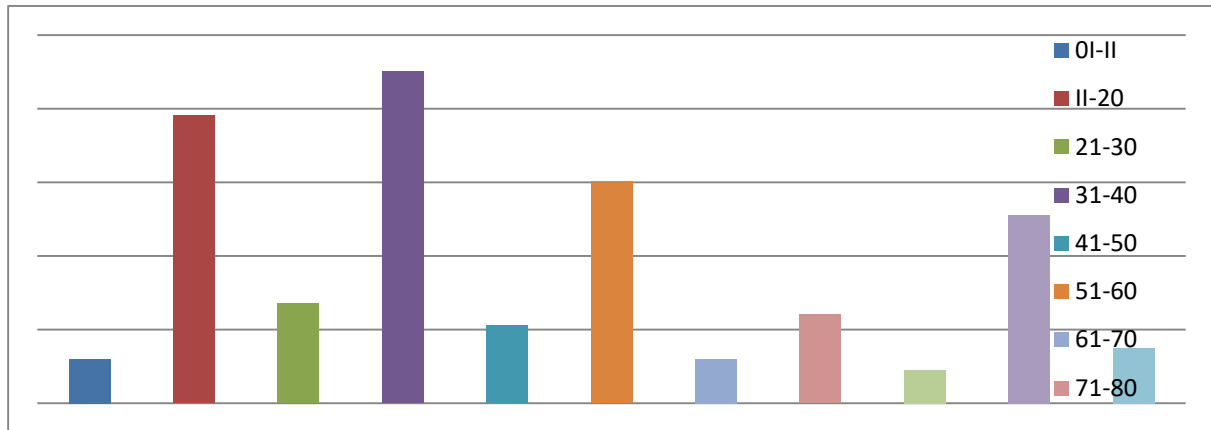
Figure 7 - Daily Amount Spent on Water Purchases

In Figure 7, 22.56 percent of the population spent between ₦31- ₦40 daily on water and about 19.55 percent spent between 11-20 naira on water while 15.04 percent spent 51-60 of their income on daily purchase of water. This showed that in the three zones, more respondents spent between 11 naira and 60 naira of their income daily on water purposes.
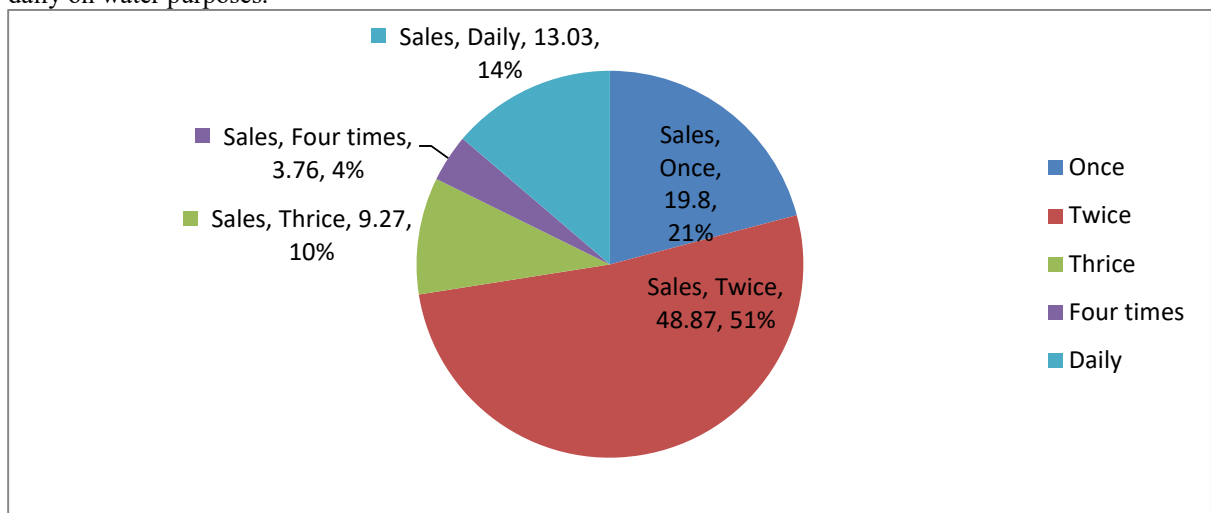
**Figure 8: Regularity of Washing Cloths Weekly**

From figure 8, Households that washed their cloths twice a week were 48.87 percent, once a week 19.8 percent, Thrice 9.27 percent, Daily 13.03 percent and Four times 3.76 percent. The highest percentage of 48.87 reflected that more households wash their cloths twice a week. This implied that more water was relatively conserved as their water could be used to wash more cloths than if they were washed daily.
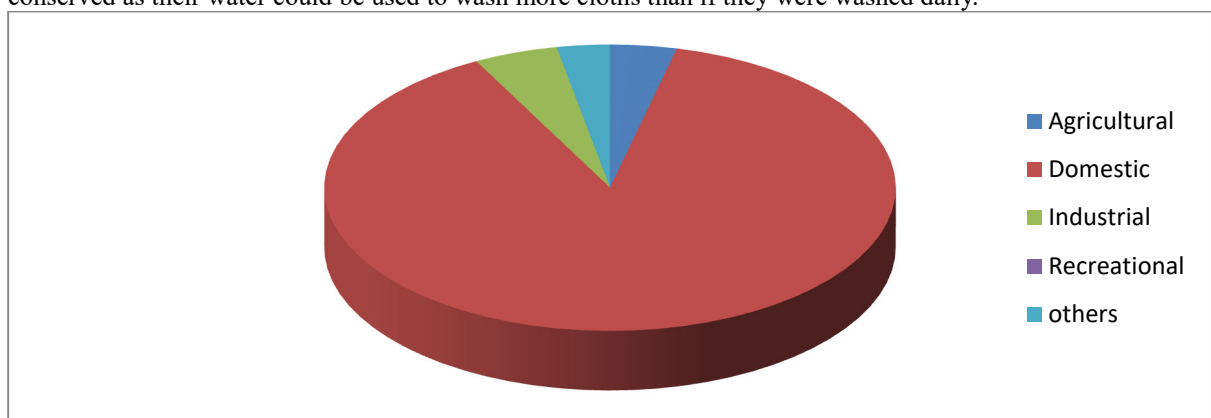

Figure 9 - Uses of Water

Figure 9 showed that 88.47 percent of water used was for domestic purposes, 4.76 percent was for industrial and 3.76 percent was for agricultural purposes while other uses showed 0.83 percent. This showed that the major uses of water in Uyo Urban were for domestic purposes.
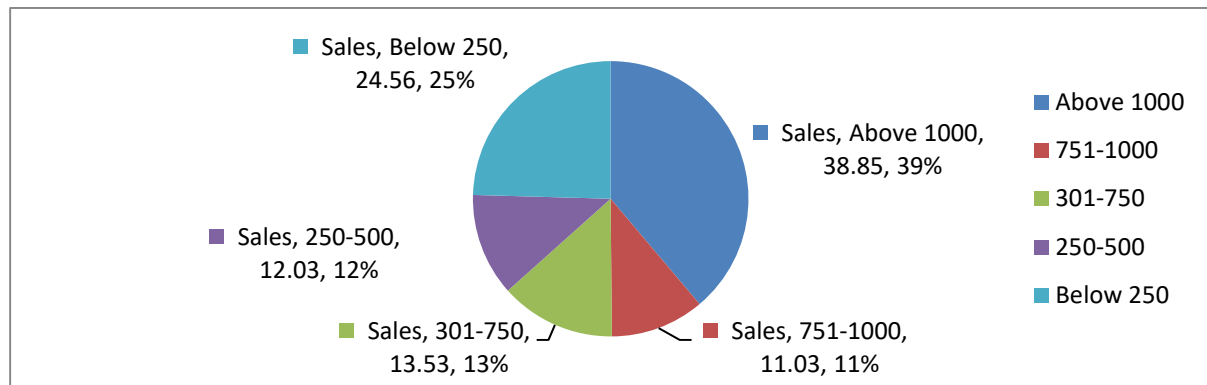
Figure 9: Average Distance from House to Public Water Supply

    The average distance from the sampled households to the public water sources was 1000 metres in zone1 which accounted for 38.85 percent of the sampled population while in zone 2 greater part of the population had a public water source close to them. Nationally, 250 metres and WHO 200 metres are accepted as the maximum distance considered tolerable to access a public water source. Most of the respondents especially in zone 2 claimed that they traveled an average distance of 1000m to access a public water source. The relationship was inversely as the distance to the water sources increase as the number of respondents decrease.
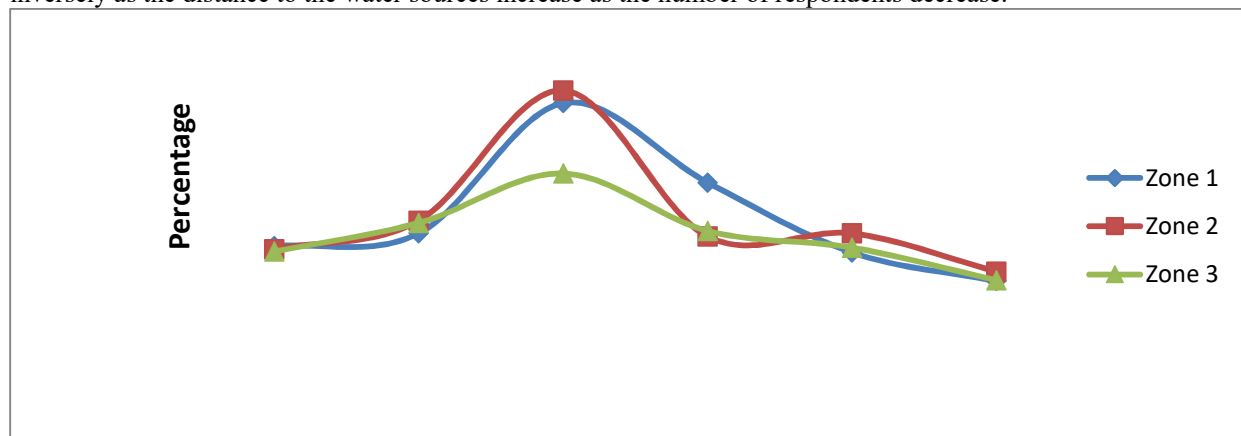
Figure 10 - Determinants of Water Consumption

    From figure 10, we observed that 35.84 percent of the sampled population showed that household size was a major determinant of water consumption, followed by the distance from the public water source, gender, educational level and income level. This showed that the household size of any population determines the amount of water used.

Testing of Hypothesis

Ho: There is no significant relationship between income and quantity of water consumed daily per household.

Hi: There is a significant relationship between income and quantity of water consumed daily per household.

Pearson's product moment correlation was employed in testing this hypothesis. The statistical formula is expressed as follows.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[\, n\sum x^2 - (\sum x)^2 \,][\, n\sum y^2 - (\sum y)^2 \,]}}$$

Table 10: Relationship between Income and Quantity of Water Consumed Daily per Household

Y	X	Y^2	X^2	XY
8	2	64	4	16
6	1	35	1	6
7	2	49	4	14
15	7	225	49	105
7	2	49	4	14
9	3	81	9	27
14	8	196	64	112
5	2	25	4	10
11	7	121	49	71
4	1	16	1	4
6	8	36	64	48
7	1	49	1	7
8	3	64	9	24
9	7	81	49	63
6	8	36	64	48
9	2	81	4	18
71	1	49	1	7
5	2	25	4	10[
$\sum$ Y = 143 9	$\sum$ X = 67	$\sum$ Y^2 = 1283	$\sum$ X^2 = 385	$\sum$ XY = 604

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[\,n\sum x^2 - (\sum x)^2\,]\,[\,n\sum y^2 - (\sum y)^2\,]}}$$

Where: r = Corrélation coefficient, x = Independent variables y = Dependent variable

$$= \frac{18 \times 604 \ - 67 \times 143}{\sqrt{18 \times (305 - (67)^2}} \times \overline{\sqrt{18 \times (1283 - (143)^2}}$$

$$= \frac{10872 - 9581}{\sqrt{18 \times (385 \ - 4489)} \times \sqrt{18 \times (1283 - 20449)}}$$

$$= \frac{1291}{\sqrt{6930 \ - 4489} \times \sqrt{23094 - 20449}}$$

$$= \frac{1291}{49.41 \times 51.42}$$

$$= \frac{1291}{2540.7}$$

$$= 0.5081$$

$$r = 0.51$$

Interpretation: A correlation coefficient of 0.51 meant that there was a significant relationship between income and quantity of water consumed daily per household. To test significant of this correlation coefficient, we employed the t-distribution given by:

$$t = r \sqrt{\frac{n-2}{1-r^2}}$$

We formulate our hypothesis:
Ho: the correlation is not significant
Hi: it is

$$t = r \sqrt{\frac{18-2}{1-0.51^2}}$$

$$= 0.51 \sqrt{\frac{16}{0.73}}$$

$$= \quad 0.51 \times 4.68$$

$$= \quad 2.39$$

Calculated value =   2.39
D/F   =   N-2   =   18 - 2 = 16
Table value - 2.31 @ 0.05 (two tailed test).
Decision: Since the calculated value is greater than the table value, Ho is rejected and Hi accepted. This means that the correlation coefficient of 0.51 is in fact significant

Discussion of findings

The study indicated that the bulk of water in Uyo Urban is from commercial boreholes, private water supply and few from public water supply. This result agrees with the study of Ansa (2014) who opined that the private sector was a major player in the supply of water to urban areas in this part of the country. The study also posited that household size was a major determinant of water consumption, followed by the distance from the public water source, gender, educational level and income level. This is in line with the study of Esin and Uwajonye (2017) who carried out a study in Oron and the result of their findings indicate that the major determinants of water consumption include household size, cost, distance, time, season of the year etc The research indicated that the quantity of water consumed in the study area was between 78-103 litres of water daily while 18.80 percent consumed between 52-77 litres of water daily. The figures showed a high ration of water conservation and management. This was because the more water they consumed, the more money they paid. This results agrees with the study of Eddy and Ekop (2007) in the study carried out in Ikot Osurua where they discovered that the quantity of water consumed daily by households was between 50 litres and 150 litres

Conclusions

The study has shown that the continuous rapid haphazard nature of development projects in the Study Area combined with the lack of adequate support for the Akwa Ibom State Water Company have combined to explain the water crisis and its associated negative impacts in Uyo Urban, hence, the unregulated involvement of the private sector in the distribution and management of water in the Study Area. The survey has yielded some useful information with regards to the spatial pattern of water distribution in the Study Area. It was shown that there is an inequitable distribution of water not only spatially between users in a given location in Uyo Urban but also temporarily between users over time. On the determinants of water consumption in the Study Area, it was evaluated that the Per Capita Volume of water consumed per day varied from zone to zone. It was also shown that the volume of water consumed was directly proportional to the household's level of income, educational status and average number of persons per household.

Finally, many researchers have shown that human survival is dependent on water. This necessity of life has been ranked by experts as second only to oxygen. This implies, clean water should reach every person irrespective of their location and social status. On this score, the distribution and management of water, which was largely controlled by the public sector, although adjudged clean as compared to the private boreholes, were inundated with challenges impeding it from getting to the poor.

Recommendations

On the basis of the findings and given the critical role water plays in the livelihoods and economies of societies, the proper distribution and management of water would generate ample opportunity for delivering on Availability, Accessibility and Affordability of water. On this score, the study makes the following

recommendations: There is need for the relevant agencies of government and stakeholders in the water sector to create greater social awareness about the right and responsibilities in the use of public water and put in place management practices in the utilisation of this available resource. Users will be willing to pay more if they understand the benefit they will derive. A re-introduction of open public taps for collection by households will assist the State in its aspiration to meet the Sustainable Development Goal 6 of ensuring availability and sustainable management of water and sanitation for all.

References

Ansa,I. E. (2014). Private Sector Involvement in Water Management in the Niger Delta: Analyses of Performance and Challenges. Unpublised Ph.D Thesis, University of Uyo, Uyo, Nigeria.

Ansa, I. E. (2006). Socio-Economic Impact of the Cross River Basin Development Authority in Akwa Ibom State. Unpublished M.Sc. Dissertation, University of Uyo, Uyo, Nigeria.

Eddy, N. O. and Ekop, A. S (2007). Assessment of the Quantity of Water Treated and Distributed by the Akwa Ibom State Water Company, *Journal of chemistry*, Department of Science Technology Akwa Ibom State Polytechnic, Ikot Osurua, Nigeria.

Faniran, A. (1989). Education of Water Resources Personnel in Nigeria, Proc. International Seminar on educational and Training in Water Resources in Developing countries. December 4-8. Aurangabad. India.

Faniran, A and Oji S. O. (1980), Man's physical Environment, Heinemann, London pp. 404.

Nest (1991). Nigeria's Threatened Environment: A National profile. Nigerian Environmental Study and Action Team. Intec Printers, Ibadan.

White, G. F., Bradley, D. G. and White, A. U. (1972), Drawers of Water, Chicago University Press, Illinois.

WHO/UNICEF (2000), Cited in Nickson, A and R. Franceys (2001), Tapping the Market – Can Private Enterprise Supply Water to the Poor ? Id2l Insights Issue #37, www.id2l.org/insights/insights37/insights-iss37-editorial.html

UN-HABITAT (2005), Managing Water for African Cities, Developing a Strategy for Urban Water Demand Management, Background Paper No.1, Expert group meeting, UNEP and UN-HABITAT