



**THE EFFECTS OF POPULATION GROWTH ON WATER SUPPLY IN OLD KARU
SATELLITE TOWN FEDERAL CAPITAL TERRITORY, ABUJA, NIGERIA**

KAMA H.G, OLUKAEJIRE S.J, JAMES T., OLUMUJI S.Z. AND ISA P.S.

Department of Geography, Nasarawa State University, Keffi-Nigeria

ABSTRACT

This study examines the Impacts of Population Increase on Water Supply in Old Karu Satellite Town Federal Capital Territory, Abuja Nigeria. The major data sources was primary and secondary and were collected from old Karu water board. A stratified sampling technique were used to select 200 respondents in four different locations within old Karu area. The data were analyzed using Pearson Product Moment of correlation and chi-square technique. The finding revealed that (44.5%) of the respondents population were more than 36 years, less than (50%) of the respondents were single and (46%) were married. Majority (39%) of the respondents went beyond secondary school, with (70%) of the respondents population employed in different sectors and government establishment. The finding also shows that Igbo, Hausa and Yoruba constitute about (53.5%) of the respondents with Gbagyi (15%) who are the indigenous people, this indicates that over (90%) of the populations are Immigrants from different part of the Country. More than half population of the respondents depends on other sources of water supply, and (37%) rely on pipe borne water supply. Majority (75%) of respondents receive pipe borne water not more than twice in a week. The sample population and total quantity of water demand show there is positive correlation ($r=0.929$), which signified that water supplied by Karu water board is not enough to meet the water demand of the people in the study area. The study recommends that, there should be increase in the volume of water supply to the study area.

Keyword: Population, Water , Respondents, Quantity, Old Karu Town,

Introduction

Water is an essential natural resource that shapes regional landscapes and is vital for ecosystem functioning and human well-being (Grafton et al, 2011). Water is

a resource under considerable pressure. Alterations in the hydrologic regime due to global climatic, demographic and economic changes have serious consequences for people and the environment. Ideally, water resource Management Planning has regard to all the competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands (Molden, 2007). Water can be regarded as a basic necessity of life and an essential infrastructure facility. Its availability, therefore, is relevant to economic development, even right from the ancient period. This is in terms of industrial growth and concentration in the favorably located urban centers in the colonial space economy, in the field of agriculture and the development of tertiary activities such as water-based recreation and tourism (Ayoade, 1995). Human depends on water for all of his activities such as domestic, agricultural and industrial activities. Stumm (2006) described water as one of the most essential requisites that nature provide to sustain the life of plants, animals and human beings. The total quantity of water on earth could satisfy all the needs of human population if it were evenly accessible (Adeyemo, 2004).

The history of economic development of any country may be located at essentially as the history of the people's increasing technological ability to manage their water resources and thereby make water available in sufficient quantity where it is required and when it is required (NEST, 1991). Public water supply and the development of any nation are continuing long term processes that require careful planning and implementation geared towards achieving improved condition of life. Improved water supply also plays a key role in the elimination or control of a number of economic, water-borne and gastro-intestinal diseases. In view of this, it could, therefore, be rightly asserted, that the proper management of the water resources of a country is the key to her economic development and hence, the improvement of the social wellbeing of her people (Nyong and Kamaroglou, 1991; Balogun, 2001).The adequacy of good quality water supply was in fact, one of the criteria that were utilized as decisional variables in objectively selecting Old Karu out of the many sites as the new capital of Nigeria. This particular criterion had a high rating of ten 10%, which is the third highest after geographic centrality, health and climate (Aguda, 1995). Abundant supply or lack of adequate water attracts or dissuades settlement in the world over; hence, human settles where there is adequate water for his various activities. As this continues, the available of water gradually becomes inadequate due to increasing population. Increase in population has significant impact on water supply and thereby, causing inadequacy of the water.

Objectives of Study

The objectives of the study is to:

1. Identify the major source of water supplied in the study area.
2. Assess the present quantity of water supplied and demand to the study area
3. Compare whether the present quantity supplied has been sufficient to meet the demand of increase population in the study area.

The study area

Old Karu is a satellite town in the FCT. It is located east of the Federal Capital City and situated within Abuja Municipal Area Council (one of the six area council of the FCT). It lies between latitude 9.0108°N and longitude 7.5753°E of the equator, just north of the confluence of the Niger River and Benue River. It is bordered Nasarawa State to the east and south, Abuja is geographically located in the center of the country. Old Karu satellite town a landmass of approximately 1216.7046 hectares, of which the village occupies six thousand square meters. It is situated within the Savannah region with moderate climatic conditions.

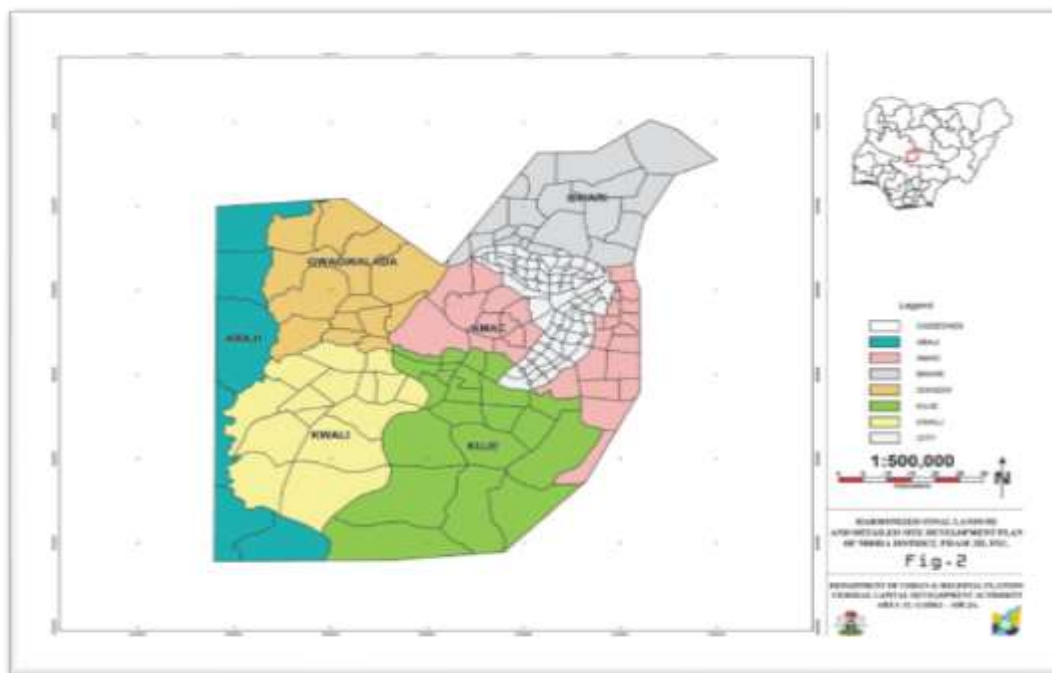


Figure 1. Map of FCT showing the Six Area Councils and Old Karu satellite town.

Abuja has witnessed a huge influx of people into the city; the growth has led to the emergence of satellite towns, such as Karu satellite town with a population of

over two hundred(200) people, Suleja, Gwagwalada, Lugbe, Kuje and smaller settlements towards which the planned city is sprawling. The unofficial metropolitan area of Abuja has a population of well over three million, making it the fourth largest metropolitan area in Nigeria. The indigenous inhabitants of Abuja are the Gbagyi (Gwari) as the major language, Bassa, Gwandara, Gade, Ganagana, Koro etc.

FCT Water Storage and Distribution to Study Area: Water is transported through the various treatment processes by gravity. Treatment water is then transported storage tanks at the edge of the city through the 41km steel pipeline (diameter 1.5/1.5m) by gravity. Water supply to Old Karu and Nyanya is from a storage tank capacity 10,000m³ located in the Old Karu hills. The tank takes its source from the Asokoro tank (tank 4). The pipeline link is through a 1.2km tunnel in the rock. The Old Karu tank supplies water by gravity to the resident of Old Karu and Nyanya (FCT Water Board, 2004).

Climate of the Study Area: The FCT experiences three weather conditions annually. This includes a warm, humid rainy season and a blistering dry season. The rainy season begins from April and ends in October, when daytime temperatures reach 28-30 degrees and nighttime lows hover around 22-23 degrees. In dry season, daytime temperature can soar as high as 40 degrees and nighttime temperature is as low as 12 degrees, resulting in chilly evenings. Rainfall in FCT reflects the territory's location on the windward side of the Jos Plateau and zone of rising air masses. The annual total rainfall is in the range of 110mm to 1600mm. **Vegetation** The area now designated as the Federal Capital Territory falls within the Savannah Zone vegetation of West Africa sub-region. **Topography and Relief** The area is generally low, undulating and dotted with rock outcrops. The heights range from 406m along the river valleys to 448.8m at the height points. The slope range from 1-10% except in rocky out crops and valley sides where the slopes range from 20-30%. Generally, the entire area slopes in a west/south west ward direction (FCDA, 1989). **Geology** The geology of the study area is made up of basement complex rocks cover about 70% of the total superficial area of the state while the remaining 40% is made up of sedimentary rocks of the middle Benue trough. **SOIL** The soil in Old Karu area shows a high level of variability, comprising mainly of sand, silt, clay and gravel. The alluvial complex found here is heavy in texture and has fairly high organic matter contents in their surface. (Mundi, 2000)

Materials and Method

The major data sources was primary and secondary and were collected from old Karu water board and through the use of questionnaire, interview with management of Karu water board, personal survey and observation were made. 200 respondents in four different locations within old Karu area were used to

select. The sampling procedure used for the administration of the questionnaires is the stratified sampling procedure. This method of sampling involves the separation of a heterogeneous population into more homogenous subgroups, classes or strata. It also involves the use of some simple random sampling in all the strata or subgroups. Hence, the households where the questionnaires were administered are chosen at random in each of the subgroups or strata and each household is chosen independent of the other.

Data Analysis

In analyzing the data used for this research, different statistical tools were used. These include percentages, which were used for determining proportions of sample sizes as well as the water demand in the different parts of Old Karu area; Measures of dispersion and central tendencies were also used such as mean and standard deviation to analyze the water supply and demand in the study area. Pearson product moments of correlation were also used for determining the amount of the responses and Chi-square Technique was used to find out the relationship between the quantity of water supply and the quantity of water demand. Tables were also used as well as maps of various aspects of the study area. The t- distribution table was also used in the interpretation of the findings at various levels of significance.

Results

Table 1. Show sampled population and total quantity of water supply.

<i>Units</i>	<i>Sample population (x)</i>	<i>Total quantity supply (y)</i>	$(x-m_x)$	$(x-m_x)^2$	$(y-m_y)$	$(y-m_y)^2$	$(x-m_x)(y-m_y)$
<i>Karu Federal Housing</i>	952	1650	223	49729	400	160000	89200
<i>Karu Layout</i>	929	1350	200	40000	100	10000	20000
<i>Karu Village Extension 2 Layout</i>	525	1050	- 204	41616	- 200	40000	40800
<i>Karu Village</i>	510	950	- 219	47961	- 300	90000	65700

<i>Total</i>	2916	5000	17933	300000	215700
--------------	------	------	-------	--------	--------

Calculation: X values $\sum x = 2916$ Mean = 729 $SD_x = 211.74$ $\sum (X - M_x)^2 = 179336$ **Y values** $\sum y = 5000$ Mean = 1250 $SD_y = 273.86$ $\sum (Y - M_y)^2 = 30000$

X and Y Combined

$N = 4$ $\sum (X - M_x) (Y - M_y) = 215700$ $CV = (X - M_x) (Y - M_y) / N$ $CV = 215700 / 4$ $CV = 53925$ **R Calculation** $r = \sum ((X - M_x) (Y - M_y) / SD_x \times SD_y)$ $r = 53925 / (211.74 \times 273.86)$ $r = 0.929$ **T test:** $T = r \sqrt{n-2} / \sqrt{1-r^2}$ $T = 0.929 \sqrt{4-2} / \sqrt{1-0.929^2}$ $T = 3.5494$ **Degree of Freedom (df):** $N-2 = 4-2 = 2$.

The table above was also used to compare the sample population and the quantity of water supplied by the Old Karu water board using the person moment correlation technique. After the analysis, the table values (at alpha levels of 0.05 = 3.18 and 0.01 = 5.84) were found to be less than the calculated value (33.71) hence we reject the null hypothesis and conclude that there is a difference between the quantity of water supplied and the quantity of water demanded by the people of Old Karu. The significance of this implication is that the quantity of water supplied by the Old Karu Water Board is not enough to meet the water demand of the people.

Table 2. Show Chi-square Analysis.

<i>Unit</i>	<i>Observed (O) Value for Water Demand and Supply</i>	<i>Expected (E) Value for Water Demand and Supply</i>	<i>O-E</i>	<i>(O-E)²</i>	<i>(O-E)²/E</i>
<i>Karu Federal Housing</i>	2700	2796.4	-96.4	9292.96	3.32
<i>Karu Layout</i>	2300	2346.4	-46.4	2152.96	0.91
<i>Karu Village Extension 2 Layout</i>	2100	2025	75	5625	2.77
<i>Karu Village</i>	1900	1832	67.9	4610.41	2.51
<i>Karu Federal Housing</i>	1650	1553.57	96.43	9298.74	5.98
<i>Karu Layout</i>	1350	1303.57	46.93	2202.24	1.65

<i>Karu Village Extension 2 Layout</i>	1050	1125	-75	5625	5.0
<i>Karu Village</i>	950	1017.85	-67.85	4603.62	4.52
<i>Total</i>					22.27

Chi-square $X^2 = 22.27$

Degree of Freedom = (column-1) x (row-1) = (2-1) x (4-1) = 1 x 3 = 3

The table was used to compare the difference between the quantity of water supplied by the Old Karu water board and the quantity of water demanded by the people of Karu Area using the chi square technique. After the analysis, the table values (at alpha levels of 0.05 = 7.81 and 0.01 = 11.34) were found to be less than the calculated value (22.27) hence we reject the null hypothesis and conclude that there is a difference between the quantity of water supplied and the quantity of water demanded by the people of Karu Area.

Despite the fact that the population of Old Karu was increase geometrically, but the quantity of water supply has not increase since the creation of the Old Karu water board from FCT. The present acute shortage of water can be explained in terms of population increase, which has by far been more than increase in quantity of water supplied. The implications of this therefore are that people now depend on alternative sources of water such as Wells, water vendor, streams and boreholes for adequate water. Secondly people spend more money to buy water than they used to. Thirdly more hours are spent in search of water and this reduces productivity. Lastly, it is the woman and children who are most affected with the problem of water supply. They are seen carrying vessels from place to place in search for water. Many people trick for long distances in search of water. In view of this implication there is an emergency need to expand the water tank in Old Karu, which is just 10000m³ capacity, since creation to a bigger tank in order to meet up with water shortage in Old Karu Area.

Conclusion

The finding of the study based on the data analysis shows that there is no significant relationship between the sample population size and the quantity of water demand. This is because different individual have different water requirements. Some may require water only four domestic uses or activities while for some, their occupation is largely Dependent on large amounts of water

supply such people includes the restaurant or hotel owners, beauticians, dry cleaner, car wash etc. This in essence means that an individual may require more water than a household. The analysis also shows that there is a significant difference between the quantity of water supplied by the Old Karu water Board and that demanded by the populace of Old Karu. In other words the quantity of water supplied is not enough to meet the people demand, thus the people also depend on other source of water supply such as wells, boreholes and many purchase water from water vendors (mairuwa). This inadequacy in water supply has been attributed to a lot of reasons. One major reason for the inadequate water supply is the increase in population. As stated earlier, most of the people in Old Karu are migrants from different parts of the country and beyond. Many people have continued to move into Old Karu and the result is that the water supply is no longer adequate to meet the demand.

Another important reason for this inadequacy in water supply is that the water agency depends on the power holding company popularly called (NEPA) for pumping and distributing water to various households, hence with this erratic power supply the water supply becomes inadequate. Most prominent among these problems is that the lower Usuma dam is no longer sufficient to meet the water demand of the whole FCT. Consequently water is been rationed to different parts of the FCT leading to inadequate water supply. Inadequate funding of the water board as well as corruption and embezzlement are also problems which have led to the inadequacy of water supply in Old Karu. This has led to low investment levels in operation and maintenance of domestic water supply infrastructures. This problem has accounted for the frequent breakdown of the production facilities and lack of proper management of the nation's water resources. Until the provision of this basic service is drastically improved, karu will remain a large unhealthy and frustrating town to live in and the resulting environmental impacts will be serious.

Recommendation

Based on the analysis and findings of the study, the researcher recommends the following:

- There should be increase in the amount or volume of water supply to Old Karu from Asokoro extension tank, because the Old Karu tank with 10000m³ capacity is main to serve both Old Karu and Nyanya which is not enough to meet the increase demand, the pipe conveying the water should be upgraded for ease of water conveyance, and there should be adequate infrastructural maintenance.

- The treatment plant should be created in Old Karu, and made to be fully functional and the water should be sourced from the river Usuma so as to reduce the pressure on the Asokoro extension tank.
- The water board should not completely depend on power holding company for their power supply; they should also have alternative sources of power supply such as solar energy so as to ensure the provision of adequate amount of water.
- More dams should be constructed in different parts of the FCT so as to reduce the number of people whose water supply is tied to the availability of water in the Usuma Dam.
- The water Board in Old Karu should improve on its services through the installation of modern sophisticated equipment for water production. Also the capacity of the water tanks should be increased to ensure adequate water availability.
- Other source of water should be properly harnessed by individuals and organizations in order to increase water supply. Harvesting of rain-water into tanks especially during the rainy season should be adequately carried out by different household so that there will be enough water for their use during the dry season.
- Fund should be made available for plant maintenance and purchasing of chemicals for the water treatment.
- Government should ensure the supply of potable water of adequate quantity and quality for the territory at economic rate.

REFERENCE

- Adeyemo, A.O. (2004) *where is the safe drinking water in Nigeria?* This day Newspaper pp, 40 Vol 9 No. 3187
- Aguda, A. (1975) *the repot of the committee on the location of the Federal capital of Nigeria*. Lagos.
- Ayoade J.O (1988) *Introduction to climatology for the Tropics*. Spectrum Books, Ibadan.
- Balogun, O. (2001) *the federal capital territory of Nigeria: A geography of its development*. University of Ibadan Press
- Chup,C.D.(2000) "Environmental Problems" in Dawm, P.D. (2000) *Goegrapy of Federal Capital Territory*. Famous/Asanlu Publishers, minna.
- Federal office of statistics (2001). *Annual abstract of statistics*. Abuja, Nigeria.
- Federal Capital Development Authority, (1989). *The Master plan for Abuja*. The Federal Capital of Nigeria.

- Federal Capital Territory Water Board (2004). *Report on water storage, quality control, distribution and maintenance, Federal Capital of Nigeria.*
- Grafton RQ, Michael B. Hang To and Tom Kompas (2011). Determinants of residential water consumption: Evidence and analysis from a 10-country household survey
- Molden D. (2007). *Water for food, water for life: A comprehensive assessment of water management in agriculture*, earthscan/international water management institute, London/Colombo
- NEST (1991). Nigerian Environmental Study/Action Team
- Nyong A.O and Kanaroglou, P.S *the influence of water resource on Rural population Distribution in northern Nigeria. Journal of Environmental science* Vol. 3, No. 1 1991 (pp 46-54).
- Stumm, Karen (2006): Time series of geochemistry, and phytoplankton abundance in surface sediment, Germany. *Pangaea*
- Twort et al (1974) *long distance water supply applied settlement and Development* Volume 9 UNESCO Report (2000) *annual report on world's water day 2000*
- World Bank report (1995) *water demand research team. The demand for water in rural areas: Determinants and policy implication* Research Observer Vol. 8 No. 1
- Federal Republic of Nigeria (1995) *report of the committee on the location of the federal capital of Nigeria.* Federal republic of Nigeria, (1991) *population census (Provisional Result).*
- Issac, C.G. (1965) *water waste and wealth: An inaugural lecture* Department of health Engineering University of Nest, U.K
- Mundi, R. (2000) "Infrastructure" in Dwam, P.D (2000) *Geography of the federal capital territory.* Famous /Asanlu publishers, minna
- National population Commission (2006) *Final Census 91 Report* NPC.