Appraisal of Factors Influencing Domestic Water Consumption in Urban Areas: The Case of Lokoja Town, Kogi-State, Nigeria

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Abstract: This paper investigates domestic water consumption patterns based on socio-economic factors: monthly income, household size and water rate. A multi-stage sampling technique was employed for the household survey in Lokoja town, which has planned and unplanned neighbourhoods. First, nine neighbourhoods were selected from the twenty-two, and then individual households were selected. The household survey was carried out using a structured interview schedule. The survey results from the 482 selected households revealed that domestic water consumption varied across the sampled neighbourhoods. Domestic water consumption was higher among residents of planned neighbourhoods than among those in unplanned neighbourhoods. Socio-economic factors- household size, monthly income and water rate exerted considerable influence on domestic water consumption. More equitable potable water distribution should be implemented by the government and residents.

Keywords: Domestic water consumption, Lokoja town, Neighbourhoods, Monthly income, Household size, Water rate

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1. Introduction

The world population is projected to reach about 10 billion by 2050, leading to a 50% increase in freshwater demand. With only about 3% of the world's water being fresh and less than 0.05% readily available, the precarious state of water supply is highlighted (Kaur & Mahajan, 2016 ;Musiea & Gonfaa, 2023).

In sub-Saharan Africa, access to potable water was 33% as of 2015 (UNICEF, 2025, cited in Abubakar, 2019). Nigeria currently has low access to portable water, with significant disparities between urban and rural areas. Less than 15% of households in Nigeria have access to piped water (Abubakar, 2019; Ripiye, 2021). While there are obvious problems of shortages across all sectors of water demand in Nigeria (Ezenwaji et al., 2015; Okeola and

Raheem, 2016), the inadequacy of water at household levels has far-reaching socio-economic and health consequences (Istifanus, 2017; Abubakar, 2019; Abdullah & Dadi-Mamud, 2023).

According to the World Health Organisation (2003) and Gleick (1996), cited in Butler & Memon (2006), 50 litres per capita is required to meet the basic domestic water needs. Abubakar (2019) and Ward (2010) posit that domestic water consumption levels vary widely among nations, with some countries struggling to meet their domestic water requirement. Butler and Memon (2006) observed that Nigeria is one of the countries unable to provide water that meets basic domestic water requirements, with per capita water consumption falling short of the recommended 50 litres per capita. According to the World Bank (1994), as cited in Sani (2007), most water urban supply services in Nigeria are highly deficient in

meeting the growing demand of the population, with the country ranking among the lowest in the world in access to potable water supply.

Lokoja, despite being endowed with surface water resources, faces domestic water supply problems that affect consumption patterns (Yusuf & Agabe, 2010). The Greater Lokoja Water Supply Scheme, initiated in 2009 and completed in 2011, aimed to complement the existing water supply in the state capital and its adjoining towns. However, the scheme is currently not operating at full capacity, and many areas in Lokoja remain underserved with potable water (Abenu, 2018).

Recurring water shortages in Lokoja have led to increased water rationing in many parts of the town, longer productive hours as adults and children spend hours searching for water, and reliance on alternative water sources of questionable quality (Nnakaike, 2023; Jimoh, 2025).

While several studies have examined access to domestic water across several regions of Nigeria (Istifanus, 2017; Ohwo & Ndakara, 2022; Abdullah& Dadi-Mamud, 2023), there is a dearth of studies that investigate the factors influencing domestic water consumption (Abubakar, 2019) across planned or unplanned neighbourhoods in urban areas. Given that the population in Lokoja is growing rapidly (Oyesanmi, 2019), particularly in unplanned neighbourhoods, it is crucial to understand the impact of these factors on limited access to water.

This study, therefore, assesses household domestic water consumption in Lokoja town, specifically examining how socio-economic factors influence consumption levels across planned and unplanned neighbourhoods.

2. Materials and methods

Lokoja town, the study area, has a land mass of 3,518 km2 (Abenu, 2016). It covers about 12% of Kogi State's total landmass and has a population of 196,643 (National Population Commission, 2006). Lokoja is located between latitude 70 451 and 70 521 north of the equator. Its longitude stretches from 60 39 I to 60 49I east of the Greenwich meridian (Audu & Rizama, 2012)
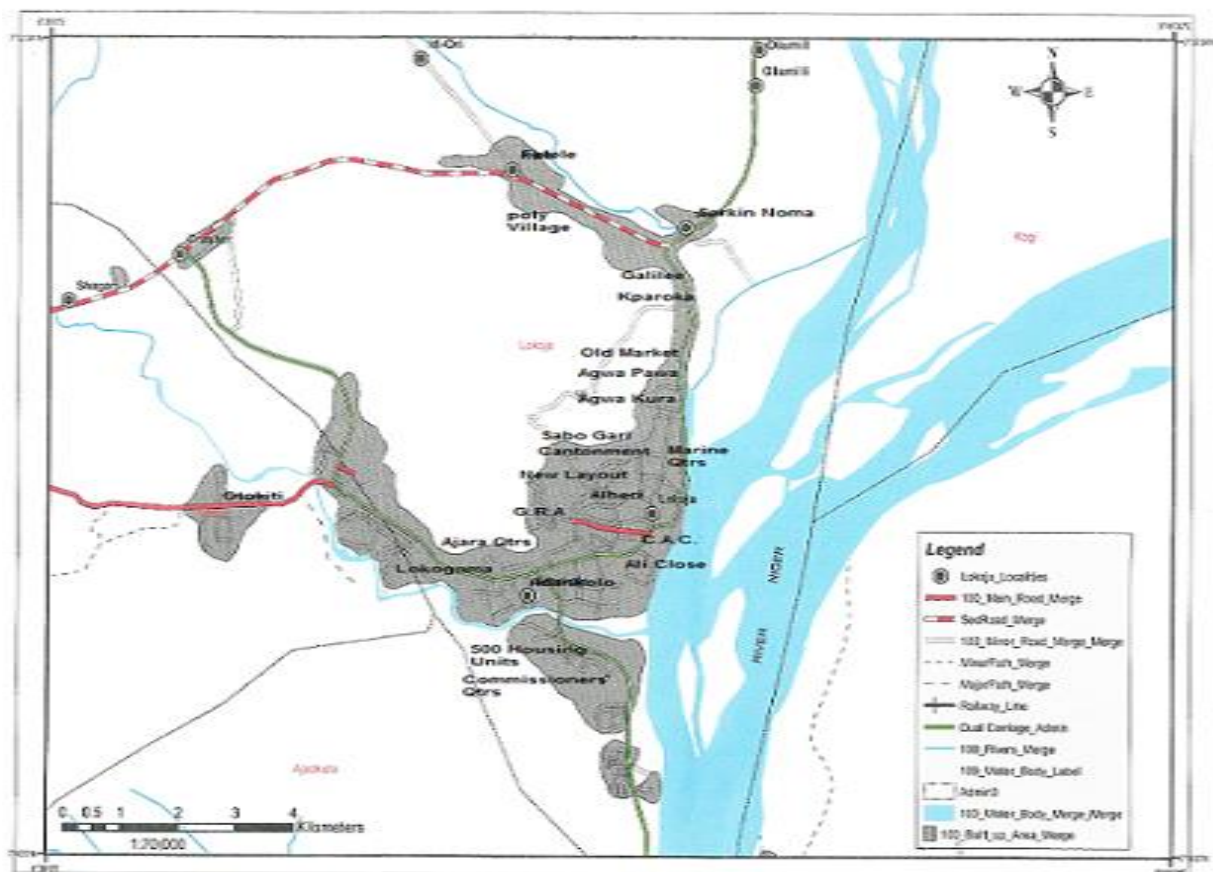

Figure 1: Lokoja Neighbourhood Map. Source: Adapted from the Administrative Map of Kogi State

Lokoja has two distinct seasons: the wet and dry seasons. The wet season, which is the rainy season, records about 1215mm annually, mainly from April to October, with its peak occurring in September (Audu, Muhammed, Umar &

Audu, 2014). The mean daily temperature is 27.7 °C (Audu & Rizama, 2012).

Although the Niger and Benue, the largest rivers in Nigeria, are the main sources of surface water in the area, there are also smaller streams such as Mmeme, Akpomoba, and Donko. In Lokoja, groundwater sources also form a

major component of the water resources. It is drawn from unconfined aquifers (Omali, 2014).

Data for the study were obtained from the structured interview schedule administered to heads of households. The target population were all the households in Lokoja town. A multi-stage sampling technique was employed for the household survey in Lokoja, which has two types of neighbourhoods: planned and unplanned. The planned neighbourhoods are fewer in number (n=8) compared to unplanned neighbourhoods (n=14). At the first stage, stratified random sampling was used to select neighbourhoods. To achieve proportional representation of each category, the selection of the nine sampled neighbourhoods was in the ratio of 1:2. The unplanned neighbourhoods had almost twice as many neighbourhoods as the planned neighbourhoods; hence, the number of neighbourhoods selected from unplanned neighbourhoods doubled the number selected from planned neighbourhoods. The highest sample came from the unplanned neighbourhoods (n=6), and the remaining sample (n=3) was from the planned neighbourhoods. Systematic sampling was thereafter used at the second stage, in which individual households were selected from the nine chosen neighbourhoods. At this stage, systematic sampling started with the random selection of the first household on each selected street, using a lottery method. Since most houses across the neighbourhoods were not numbered in an orderly manner, a physical count was conducted, and the tenth house from the first selected household was included in the household survey.

Table 1: Structured Interview Schedule Administered to Sampled Households in Lokoja

Neighbourhoods		Number of Respondents	
		Frequency	Percent (%)
Planned Neighbourhoods	Ali Close	41	8.5
	Lokogoma	67	13.9
	Otokiti	29	6.0
	Adankolo	78	16.2
	Felele	121	25.1
Unplanned Neighbourhoods	Galilee and Kporoka	13	2.7
	Old Market and environs	52	10.8
	Poly Village	24	5.0
	Sarkin - Noma	57	11.8
	Total	482	100%

3. Results and Discussion

3.1 Domestic Water Consumption Based on Monthly Income

Per capita water consumption varied among and within the three income groups (see Figure 2). In the group where the head of the household earns below N 20,000, per capita water consumption varied from 11 litres/capita/day to 90 litres/capita/day across the sampled neighbourhoods. Specifically, only one neighbourhood attained the benchmark of 50 litres/capita/day, the quantity that WHO (2003) considered sufficient to meet basic domestic needs. Among those who earned between N20,000 and N40,000, the number of households that recorded more than 50 litres/capita/day in their domestic water consumption was higher, as revealed by results from three neighbourhoods. Five neighbourhoods reached the 50 litres/capita/day domestic water consumption threshold in the highest-income group. There was generally an increase in the number of neighbourhoods consuming 50 litres/capita/day as the monthly income of household heads rose. The amount of domestic water consumption was thus revealed to be, in the month of Ogunkolu et al. (2023) and Abdullah and Dadi-Mamud (2023), studies conducted in parts of North-Central Nigeria, highlighting the significant role of economic factors in the observed disparity in domestic water consumption.

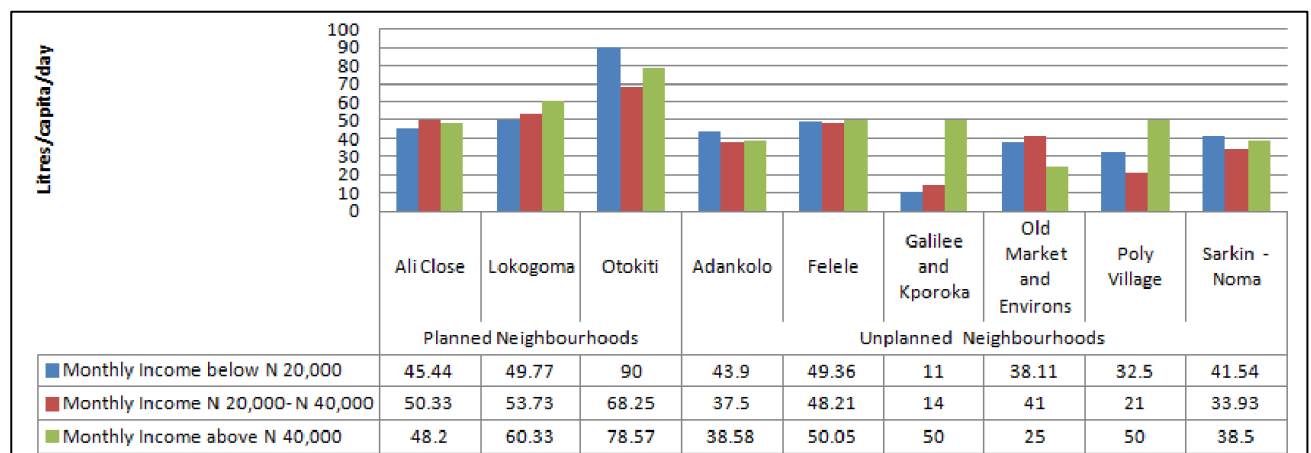|	Ali Close	Lokogoma	Otokiti	Adankolo	Felele	Galilee and Kporoka	Old Market and Environs	Poly Village	Sarkin - Noma
Monthly Income below N 20,000	45.44	49.77	90	43.9	49.36	11	38.11	32.5	41.54
Monthly Income N 20,000- N 40,000	50.33	53.73	68.25	37.5	48.21	14	41	21	33.93
Monthly Income above N 40,000	48.2	60.33	78.57	38.58	50.05	50	25	50	38.5

Figure 2: Water Consumption in Sampled Neighbourhoods Based on Monthly Income

3.2 Domestic Water Consumption Based on Household Size

Domestic Water Consumption Based on Household Size The highest domestic water consumption, 70.0litres/capita/day, was recorded in small households (1-5 members). Five neighbourhoods out of the nine sampled, two planned and three unplanned, had a record of domestic water consumption that was higher than 50.0litres/capita/day (see Figure 3). This result reflects the fact that small household sizes had water quantity above the average per capita water consumption in the study area (47.5 litres/capita/day). It shows that with just a few people using water in such households, there was more water per person. Moderate households (6-10 members) and large households (11-15 members) in fewer neighbourhoods had water consumption levels greater than 50.0 litres/capita/day; a result indicating greater pressure on per capita domestic water consumption in larger households. In very large households (above 15 members), none of the neighbourhoods recorded a value above 50.0 litres/capita/day. While one had a figure slightly higher than Lokogoma and Otokiti, at less than 5 litres/capita/day, compared to much higher differences observed in most unplanned neighbourhoods. It was observed that there was a vast difference between the highest and lowest per capita domestic water consumption in Ali Close. This disparity of results between Ali Close and the other planned neighbourhoods cannot be explained by access alone, as there may be some other underlying factor(s) responsible for this. The largest variance (46.6 litres/capita/day) in per capita domestic water consumption among the sampled neighbourhoods was in Galilee, a place with communal stand taps. The result suggests that the waiting time at some communal stand taps made water availability insufficient, thereby affecting water consumption in some households, particularly the very large households whose members need to commute to the water points several times before getting sufficient water for their requirements. This study's findings, where small households have Istifanus (2017). Although Oyesanmi (2019) observed that larger households consume more water and Ogunkolu et al. (2023) posited that the larger the household, the higher the domestic water use (p.62), their studies in Lokoja did not specify the per capita water consumption. In Lokoja, where domestic water inadequacy has been established due to inadequate public mains and water rationing (Nnakaike, 2023; Jimoh, 2025), the observed trend is that larger households have lower per capita water consumption.
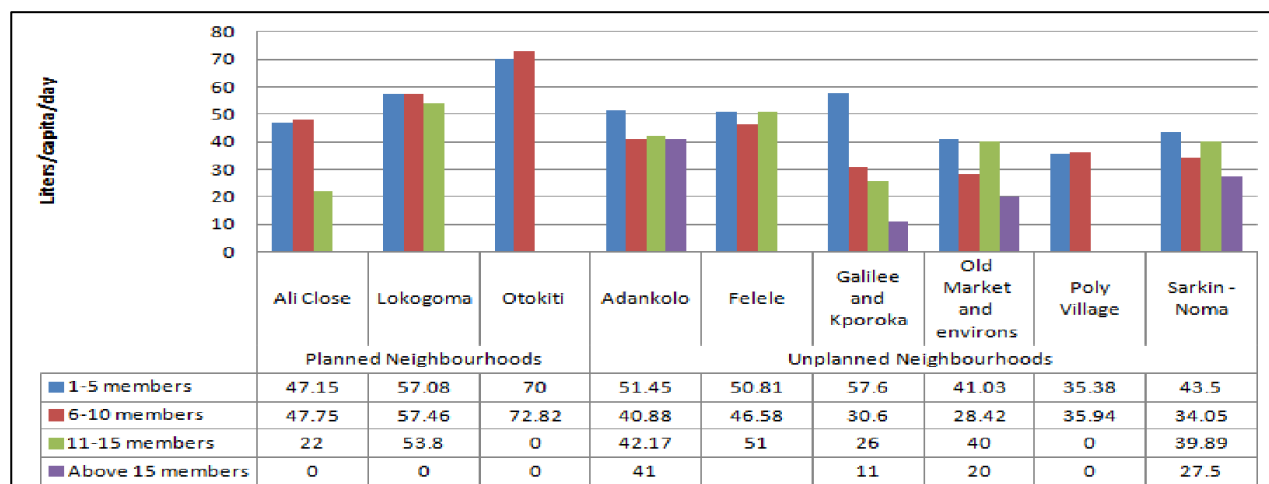

	Ali Close	Lokogoma	Otokiti	Adankolo	Felele	Galilee and Kporoka	Old Market and environs	Poly Village	Sarkin -Noma
1-5 members	47.15	57.08	70	51.45	50.81	57.6	41.03	35.38	43.5
6-10 members	47.75	57.46	72.82	40.88	46.58	30.6	28.42	35.94	34.05
11-15 members	22	53.8	0	42.17	51	26	40	0	39.89
Above 15 members	0	0	0	41		11	20	0	27.5

Figure 3: Domestic Water Consumption Based on Household Size

3.3 Domestic Water Consumption Based on Water Rate

Per capita water consumption in most neighbourhoods was highest when the water rate was low, and they paid nothing for the water they consumed (see Figure 4). This pattern of water consumption was observed in five of the sampled neighbourhoods, both planned and unplanned (Ali Close, Lokogoma, Adankolo, Galilee, and Poly village). This result indicates that water use is more likely to increase when the payment for it is relatively low. Very few households paid high water rates (above N 100) across the sampled neighbourhoods, and water consumption varied from 20 litres/capita/day to 52.6 litres/capita/day in neighbourhoods that paid higher water rates. While water is essential to human wellbeing, water rates were a factor that affected water consumption, resulting in relatively higher consumption at low rates and vice versa. A similar outcome was reported in Ripiye's (2021) study in Abuja, Nigeria, where it was observed that when water rates are high, people tend to either use less water in their households or seek alternative, virtually free sources, such as rivers and shallow wells on dry riverbeds.
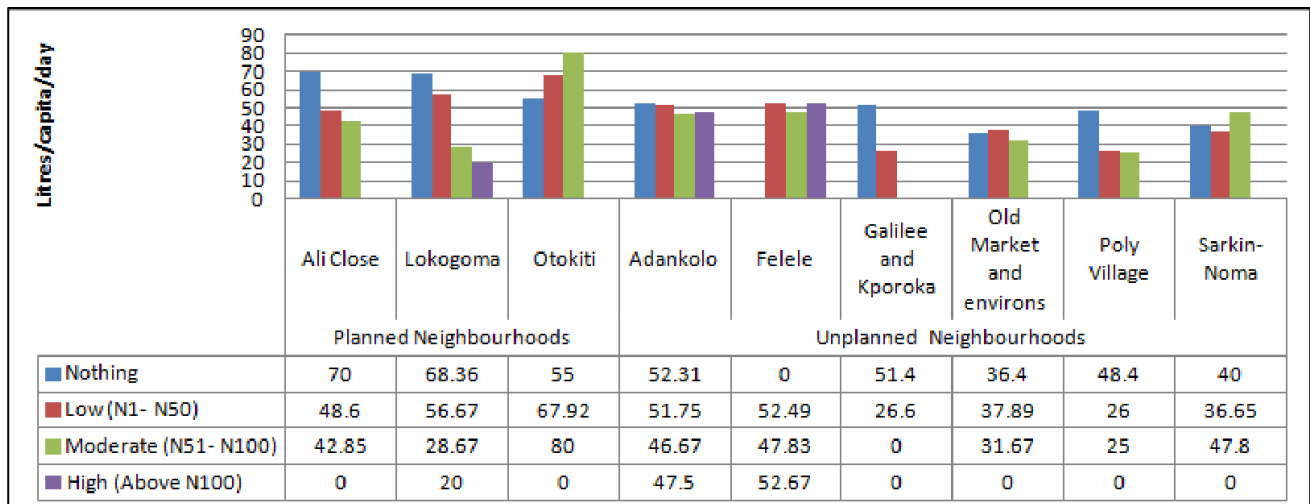
	Ali Close	Lokogoma	Otokiti	Adankolo	Felele	Galilee and Kporoka	Old Market and environs	Poly Village	Sarkin-Noma
	Planned Neighbourhoods			Unplanned Neighbourhoods					
Nothing	70	68.36	55	52.31	0	51.4	36.4	48.4	40
Low (N1- N50)	48.6	56.67	67.92	51.75	52.49	26.6	37.89	26	36.65
Moderate (N51- N100)	42.85	28.67	80	46.67	47.83	0	31.67	25	47.8
High (Above N100)	0	20	0	47.5	52.67	0	0	0	0

Figure 4: Domestic Water Consumption Based on Water Rate

3.4 Per Capita Domestic Water Consumption in Sampled Neighbourhoods

In the planned neighbourhoods with the highest access to potable water supply, per capita domestic water consumption varied from 46.10 litres/capita/day to 71.66 litres/capita/day. These are neighbourhoods with the highest number of days of water supply/flow per week (5-7 days/week). The result in Lokogoma and Otokiti, where water consumption levels were high, coincided with areas where the proportion of heads of households earning above N 40,000 was higher. This suggests that, in the planned neighbourhoods, access to a potable water supply and monthly income enabled respondents to have greater per capita domestic water consumption. In most unplanned neighbourhoods, consumption was less than 40 litres/capita/day. But the difference between Felele, where the highest per capita consumption was found, and Old Market and environs, the neighbourhood with the lowest per capita domestic water consumption in the unplanned neighbourhoods, was not remarkable. Felele, without access to potable water, consumed more water than any other unplanned neighbourhood. This indicates that the availability of alternative water sources (e.g., rainwater harvesting and groundwater) with ample supply greatly enhances domestic water consumption. Generally, domestic water consumption was higher in the planned neighbourhoods than in the unplanned neighbourhoods. Per capita water consumption was affected by access to potable water and household income.

Table 2 presents the ANOVA results for the socio-economic factors influencing domestic water consumption in Lokoja, specifically household size, monthly income, and water rate. The descriptive tests (see Figures 2-5) revealed non-uniform water consumption patterns. The ANOVA reaches statistical significance at $p < .05$. Among the three socio-economic factors, household size ($p = 0.001$) and water rate ($p = 0.026$) significantly impacted domestic water consumption. This finding aligns with previous studies by Lee et al. (2024), Abdullah et al. (2019) and Istifanus (2017) in Northern Nigeria, as well as Ogunbode et al. (2025) in South-West Nigeria.
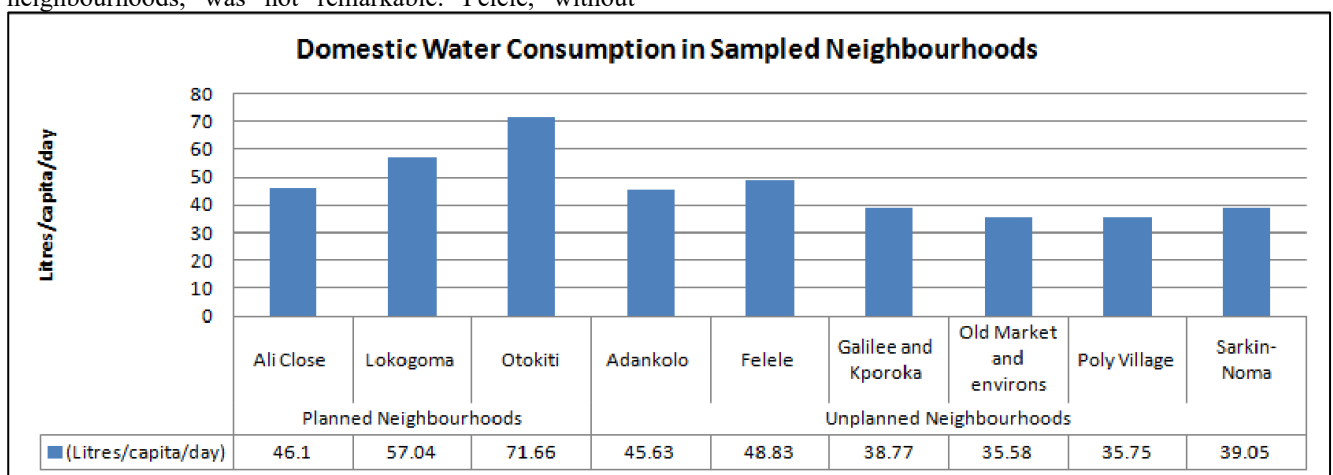

	Ali Close	Lokogoma	Otokiti	Adankolo	Felele	Galilee and Kporoka	Old Market and environs	Poly Village	Sarkin-Noma
	Planned Neighbourhoods			Unplanned Neighbourhoods					
(Litres/capita/day)	46.1	57.04	71.66	45.63	48.83	38.77	35.58	35.75	39.05

Figure 4: Domestic Water Consumption Based on Water Rate

Table 2: Anova Results

Socio-economic factors		Sum of Squares	df	Mean Square	F	Sig.
Household Size	Between Groups	751.872	4	375.936	0.83	.001
	Within Groups	47560.794	478	452.96		
	Total	48312.667	482			
Income	Between Groups	1804.791	3	601.597	1.694	.390
	Within Groups	23090.194	479	355.234		
	Total	24894.986	482			
Water Rate	Between Groups	607.016	4	303.508	0.557	.026
	Within Groups	113439.93	478	545.384		
	Total	114046.95	482			

4. Conclusion and recommendations

The experience of those living in planned neighbourhoods regarding water consumption differs from that of those in unplanned neighbourhoods. A higher level of water consumption was observed in the planned neighbourhoods, where per capita water consumption met the basic quantity recommended by WHO for domestic water needs. All the unplanned neighbourhoods had per capita water consumption below the 50 litres/capita/day mark. The problem of water insufficiency in unplanned neighbourhoods was glaring in this study.

Since access to potable water between neighbourhoods is unequal and people's socio-economic conditions differ, the town's heterogeneous nature will continue to lead to disparities in water consumption. To narrow the gap between those who have so much and those with so little, water rationing should be the same in both planned and unplanned neighbourhoods. In addition, people should be educated to properly allocate potable water for uses suited to its quality and increasingly embrace the use of grey water for non-potable uses and rainwater harvesting, which do not deplete traditional water sources. Water users should be informed about the need to avoid water waste. Taps should be turned off when not in use, and leaks should be promptly attended to facilitate efficient water use.

References

Abdullah, A., B. S. U. Ibn Abubakar, B.S.U., & Jones, A.N. (2019). Pattern of Residential Water Demand Analysis for Maiduguri Metropolis, North-Eastern Nigeria. *Arid Zone Journal Of Engineering, Technology & Environment, 15*(2),292-303.

Abdullah, S. M., & Dadi-Mamud, J. N. (2023). Assessment of Water Use across different Wards in Minna Town, Niger State, Nigeria. *International Journal of Geography & Environmental Management, 9*(5),16-21.

Abenu, A. (2016). An assessment of grey water reuse in Lokoja Town, Kogi-State. Unpublished PhD Thesis, Department of Geography, Nasarawa State Univeristy, Keffi, Nasarawa - Nigeria.

Abubakar, I.R. (2019). Factors Influencing household access to drinking water in Nigeria. *Utilities Policy,58*(1),40-51.

Audu, E.B. (2008). The challenges facing satellite towns in the Federal Capita Territory (FCT), Abuja: case study of Lugbe. *Abuja Journal of Geography and Development, 2*(2),78-94.

Audu, E.B., & Rizama, D.S.(2012). Rainfall variability as indices of climate variability: evidence from Lokoja and environs, Kogi State, Nigeria. *International Journal of Applied Research and Technology, 1*(6), 281-288.

Butler, D., & Memon, F. A. (2006). 'Water consumption trends and demand forecasting techniques,' in Butler, D. and Memon, F. A. (ed.) Water demand management. London: IWA Publishing, pp. 1-26.

Istifanus, V. (2017) Analysis of Quantity of Domestic Water Use in Bauchi Metropolis. *Journal of Environmental Science, Toxicology and Food Technology, 11*(6), 1-5.

Jimoh, Y (2025, May 6). Epidemic looms as water scarcity hit Lokoja. Nigeria Tribune

Lee, S., Kalang, N.J., Ahmed, A.T., & Umar, M. (2024). Analysis to determine the domestic water usage in Yolde - Pate Area of Yola South Local Government Area of Adamawa State Nigeria. *World Journal of Advanced Research and Reviews, 22*(03),386–403.

Musiea, W.& Gonfaa, G. (2023). Fresh water resource, scarcity, water salinity challenges and possible remedies: A review. *Heliyon, 9.* https://doi.org/10.1016/j.heliyon.2023.e18685

National Population Commission (2006). 2006 Census of the Federal Republic of Nigeria: Priority Table. Abuja, Nigeria Vol. 2.

Nnakaike, V (2023, January 19). Water scarcity hits Lokoja, Government begs Residents for patience. Business Day. https://businessday.ng/news/article/water-scarcity-hits-lokoja-govt-begs-for-residents-patience/

Ogunbode, T.O., Oyebamiji, V.O., Oyelami, A.A.,& Akinkuoli, T. A. (2025). Evaluating basic household characteristics influencing domestic water demand in tropical environments: a comprehensive case study. *Applied Water Science, 15,*9. https://doi.org/10.1007/s13201-024-02323-

Ogunkolu, A.B., Stephen, F.O., Ogbole,M., & Oyetunji, A.B. (2023). Assessment of the Drivers of Domestic Water Consumption Pattern in Idahlga, Kogi State. *The Journal of Development Practice, 8*(1), 47-6.

Ohwo,O., & Ndakara,O.E. (2022). Analysis of Domestic Water Services in Yenagoa, Nigeria. *Journal of Studies in Social Sciences, 21*(6), 1-22.

Oyesanmi, R.O. (2019). Assessing and Modeling the Determinants of Household Water Consumption in Lokoja Town, Kogi State. *Fudma Journal of Sciences, 3*(4), 105 –114.

Ripiye, A.E. (2021). Barriers to the Adoption of Soft Path Approach to Water Management in Abuja, Federal Capital Territory, Nigeria. Unpublished PhD Thesis, Department of Geography University of Abuja, Nigeria.

Sani, M. (2007). Cost Recovery in Urban Water Supply: Prognostics and Implication. *The Abuja Journal of Geography and Development, 1*(1), 68-77.

World Health Organization (2003). Domestic Water Quantity, Service, Level and Health. Geneva, Switzerland: *World Health Organization.*

World Health Organization (2005) Ecosystem and Human Well-Being, Geneva, Switzerland.

Yusuf, Y.O., & Agabe, V. (2010). *Assessment of water supply and distribution in Lokoja township, Kogi state*. A Paper Presented at the 51st Annual Conference of the Association of Nigerian Geographers, 7-11 March, 2010. www.abu.edu.ng/publications/2013-03-14-095653_5380.doc.