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Patterns of Household Water Demand and Supply in And Around Naka Town, Gwer-West, Benue State, Nigeria

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Abstract- ***This study examines the spatial and functional patterns of household water demand and supply in Naka Town and its surrounding neighbourhoods in Gwer-West Local Government Area, Benue State, Nigeria. Using a descriptive cross-sectional survey design, data were collected from 385 households selected through stratified random sampling across fifteen residential zones. The study employed structured questionnaires to capture household water use behaviour, access conditions, and consumption levels. Descriptive and inferential analyses were conducted using Excel and SPSS (version 22), while water demand–supply gaps, deficit percentages, and per capita consumption were computed using standard water resource assessment formulas. Findings reveal substantial variation in daily water demand across neighbourhoods, with High Level (80,800 L), Kper-anna (71,717 L), and Atsaha (68,370 L) exhibiting the highest demand, driven by larger populations and socio-economic activities. Total daily demand across Naka was 699,430 L, whereas supply amounted to 436,540 L, leaving a deficit of 262,890 L (37.59%). Water supply coverage varied widely, from 51.63% in Atukpu to 79.37% in Onmbaasha. Per capita water supply averaged 43.4 L/person/day, far below the WHO minimum of 100 L, indicating widespread scarcity. The results found significant spatial disparities in water access and underscore the need for equitable distribution, infrastructural upgrades, and sustainable water management strategies to strengthen water security in Naka and its environs.***

Key Words: Household, Water, Demand, Supply Neighbourhoods, Naka town

I. INTRODUCTION

Access to adequate and reliable water supply is central to public health, economic development, and environmental sustainability. Household water demand and supply patterns determine the extent to which communities can meet basic needs, maintain hygiene, and support socio-economic activities. Globally, water insecurity persists despite decades of investment and international commitment, including the United Nations' International Decade for Action on "Water for Sustainable Development" (2018–2028) and the emphasis on universal water access under Sustainable Development Goal 6 (UN, 2021). Rising population, climate variability, weak water infrastructure, and governance deficits continue to widen the gap between available water resources and household needs (World Bank, 2020; UN-Water, 2022). Sub-Saharan Africa remains one of the regions most affected by inadequate domestic water supply. More than 400 million people lack access to safely managed drinking water, with households depending heavily on unprotected wells, surface water, and seasonal sources (WHO & UNICEF, 2021). Studies have shown that household-level water access in the region is shaped by socio-economic status, settlement characteristics, hydrological variability, and infrastructural limitations (Adams et al., 2019; Mussa et al., 2020). These factors interact to influence water-use behaviour, coping strategies, and the reliability of daily water supply.

In Nigeria, household water demand and supply challenges have intensified due to rapid population growth, declining public water infrastructure, and increasing reliance on informal or self-provisioned sources such as boreholes and hand-dug wells (Olawuyi, 2021; Ezenwaji et al., 2017). Although the country possesses significant surface and groundwater resources, distribution is uneven, and many local water supply schemes operate far below capacity due to poor maintenance, vandalism, funding gaps, and climate-related pressures (Adeleye et al., 2019; Ezemonye & Emeribe, 2020). Consequently, millions of households, particularly in rural and peri-urban areas, experience recurrent water shortages and rely on alternative sources that are often inadequate or unsafe. Naka town and its surrounding communities in Gwer-West Local Government Area reflect these national and regional patterns. The area has experienced steady population growth driven by natural increase, rural–urban drift, and displacement from neighbouring communities affected by insecurity. However, water

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supply infrastructure has not expanded at a comparable pace. The public water system, including the local mini-water scheme, operates irregularly due to obsolete equipment, insufficient treatment capacity, erratic power supply, and maintenance challenges. As a result, households rely on a mix of formal and informal water sources, boreholes, hand-dug wells, streams, ponds, sachet water, and seasonal rainwater harvesting, which vary in reliability, accessibility, and quality. Seasonal fluctuations, especially during the dry season, further intensify pressure on available sources and shape household water-use patterns.

Existing studies in Nigeria provide insights into domestic water access but often lack local specificity for semi-urban towns such as Naka. Earlier works focused on broader challenges of rural water supply (Ishaku et al., 2011), the role of infrastructural decay (Ocheri, 2010), or general water accessibility in urbanising areas (Ogundobe & Ifabiyi, 2014; Mela, 2018). Recent research in North-Central Nigeria has highlighted issues of groundwater potential and water resource management (Ishaku et al., 2023; Oyinloye et al., 2021), but limited studies have examined how demographic factors, socio-economic characteristics, and seasonal variations jointly influence household water demand and supply at the community scale in Naka. This gap constrains evidence-based planning and the development of targeted interventions for sustainable water management.

Understanding household water demand and supply patterns in and around Naka is therefore essential for effective policy formulation, infrastructure planning, and community-level interventions. Such an assessment can also support progress toward SDG 6 by providing empirical evidence on accessibility, reliability, safety, and seasonal dynamics of household water sources. Against this background, the present study investigates the spatial and temporal patterns of water demand and supply among households in Naka town and its environs, with the aim of informing sustainable water management strategies that enhance resilience and improve the well-being of the population.

II. MATERIAL AND METHODS

Study Area

Naka, the headquarters of Gwer-West Local Government Area in Benue State, is located about 40 km south of Makurdi along the Makurdi–Ankpa road. The town lies within latitudes 7°31'–7°37' N and longitudes 8°12'–8°16' E, covering a landmass of 1,479 km² and sharing boundaries with Saghev/Ukusu, Sengev/Yenge, Tsambe/Mbesev, Mbapa, Mbabuande, and Tijime (Figure 1). The area is characterised by low-lying terrain ranging from 100–250 metres above sea level, with gently undulating landforms shaped by seasonal stream erosion. Drainage is dominated by several ephemeral streams such as Nagi, Anna, and Kpukulu, alongside the Naka Earth Dam, which is the main water source but often suffers from pollution due to stagnation and misuse.

Geologically, Naka lies within the Lower Benue Trough, a sedimentary basin formed during the Cretaceous rifting of the South Atlantic. The underlying formations consist of sandstones, shales, siltstones, and lateritic crusts, which influence aquifer properties, groundwater flow, and soil characteristics. The predominant soils, tropical ferruginous and hydromorphic types, exhibit clay-loamy textures, moderate water retention, and seasonal cracking, affecting infiltration, runoff, agriculture, and groundwater recharge. Climatically, the area experiences a tropical wet-and-dry (Aw) climate with a seven-month rainy season (April–October), annual rainfall of 1,200–2,000 mm, and a dry season from November to March. Temperatures remain high year-round, with distinct cool-dry, pre-rain, and hot-wet periods influenced by the seasonal migration of the Inter-Tropical Discontinuity.

Naka falls within the Guinea savannah zone, characterised by tall grasses, scattered trees, and vegetation that changes colour across seasons. Human activities have significantly altered the natural vegetation, although species such as *Daniella oliveri*, *Parkia biglobosa*, and *Andropogon gayanus* remain common. The town is predominantly inhabited by the Tiv ethnic group, alongside Idoma, Igbo, Hausa, Yoruba, Igede, and other minorities. Agriculture is the main livelihood activity, supported by fertile soils that enable the cultivation of diverse food and cash crops,

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as well as livestock rearing. Other economic activities include civil service work, trading, small-scale industries, and services offered by schools, health centres, markets, and religious institutions. The settlement pattern is nucleated, with clustered houses, delineated plots, and basic street and drainage systems that support mobility and runoff management within the town.

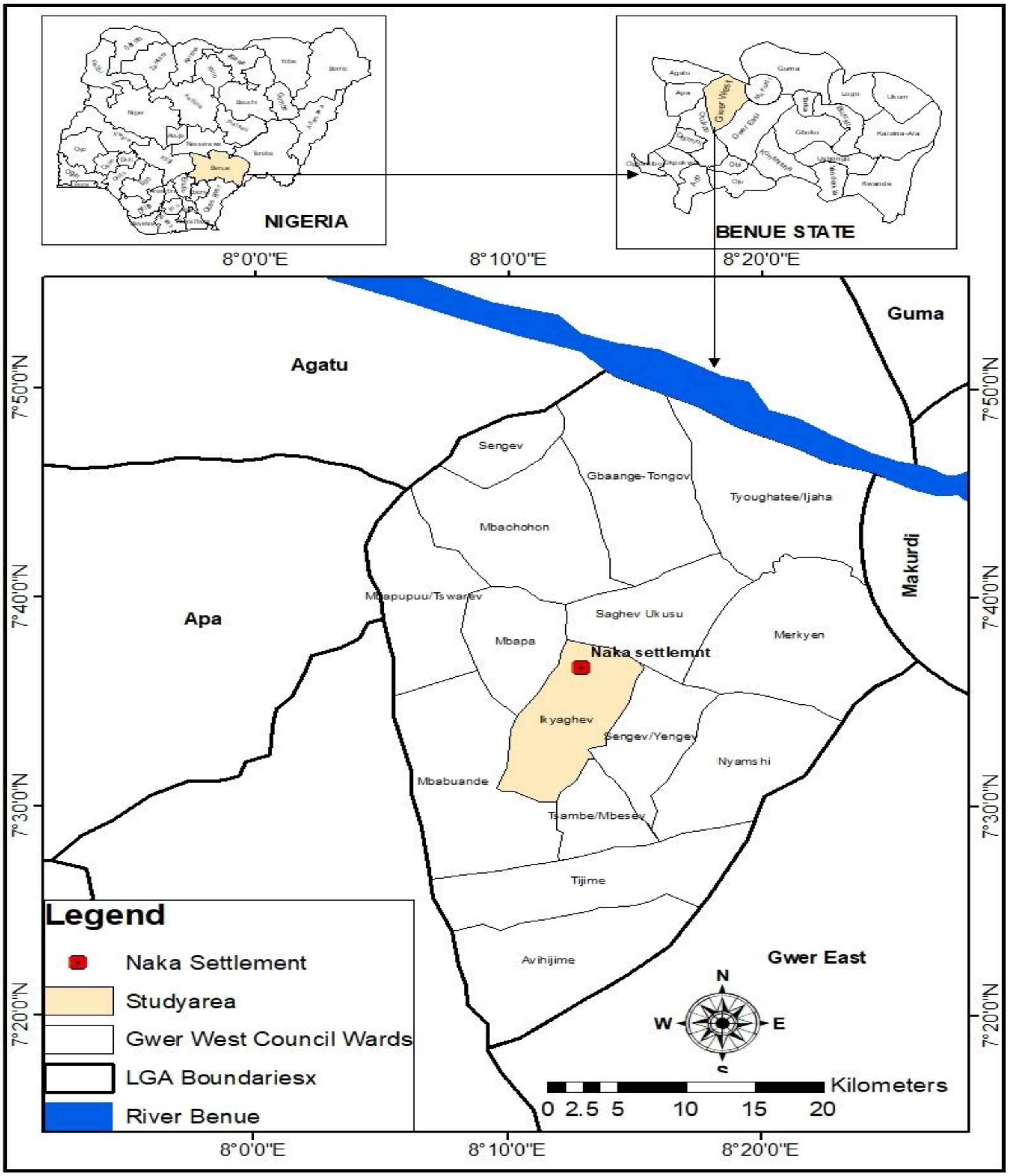

Figure 1: Gwer West Local Government Area Showing Naka Town

Source: GIS Lab. Department of Geography, Rev. Fr. Moses Orshio Adasu University, Makurdi, (2025)

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Methods

The study population comprised 10,120 households, identified through a reconnaissance survey, forming the sampling frame. Using the Taro Yamane (1967) formula at a 5% precision level, a final sample size of 385 households was determined. A stratified random sampling technique was applied to ensure that the fifteen residential zones in Naka were proportionately represented. Each zone received a sample allocation based on its household population size, resulting in a balanced and representative distribution of questionnaires across diverse neighbourhoods. Data for the study were collected through questionnaires. A total of 385 questionnaires were distributed, focusing on household-level determinant of water supply and demand. For data analysis, the study adopted both descriptive and inferential statistical approaches.

Water scarcity or water deficit occurs when the available water supply is less than the total water demand within a specific period. It is expressed as:

i. Water Deficit (WD) = Water Demand (D) - Water Supply (S) (1)

Where:

Water Demand (D) = The total volume of water required by households for various uses.

Water Supply (S) = The total volume of water supplied or actually consumed.

Water Deficit (WD) = The Difference

ii. To express water deficit (or scarcity) as a percentage, the deficit value is compared to the total demand. The standard formula is:

$$\text{Water Deficit (\%)} = \frac{\text{Water Demand} - \text{Water Supply}}{\text{Water Demand}} \times 100$$

(2)

iii. Per Capita Water Consumption – Definition and Formula

Per capita water consumption refers to the average amount of water used by one person in a given period (usually per day). It is a key indicator in water resource management, urban planning, and demand analysis.

$$\text{Per Capita Water Consumption (q)} = \frac{\text{Total Water Supplied or Consumed (S)}}{\text{Total Population (P)}}$$

(3)

All analyses were conducted using Excel and SPSS (version 22), ensuring accurate interpretation and visual presentation of the data.

III. RESULT AND DISCUSSION

Result

Pattern of Water Demand in Naka Town and its Environs

The result of the average daily households' water demand (litres) in Naka is presented in Table 2 and Figure 2. The result indicates that there is significant variation in water demand across different neighbourhoods and uses, reflecting differences in household size, socio-economic status, and water-use behaviour.

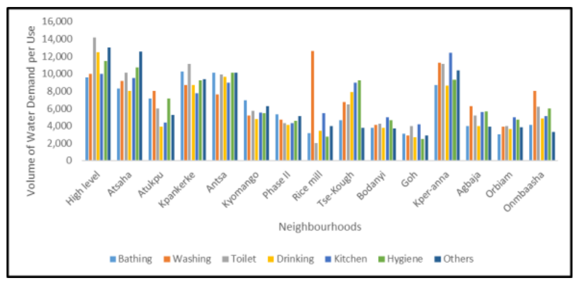

Figure 2: Households' Water Demand in Naka Town, Benue State

Among the neighbourhoods, High Level recorded the highest total water demand of 80,800 litres (12%), showing its status as the most water-dependent area, likely due to higher population density and lifestyle demands. This was followed by Kper-anna with 71,717 litres (11%) and Atsaha with 68,370 litres (10%), indicating substantial daily water use in these areas. In contrast, neighbourhoods such as Goh (22,237 litres, 3%), Bodanyi (29,158 litres, 4%), and Orbiam (28,025 litres, 4%) recorded the lowest water demand, suggesting either smaller household sizes, lower water availability, or limited access to water infrastructure. Neighbourhoods like Phase II (32,401 litres, 5%) and Agbaja (34,625 litres, 5%) also showed relatively low demand, pointing to variations in socio-economic conditions and water use practices within Naka.

Table 2: Average Daily Households`Water Demand (Litres)

Neighbourhoods	Bathing	Washing	Toilet	Drinking	Kitchen	Hygiene	Others	Total	%
High level	9,600	10,000	14,200	12,500	10,000	11,500	13,000	80,800	12
Atsaha	8,300	9,200	10,150	8,000	9,500	10,700	12,520	68,370	10
Atukpu	7,150	8,000	6,000	3,895	4,375	7,145	5,270	41,835	6
Kpankerke	10,255	8,700	11,100	8,678	7,750	9,250	9,350	65,083	9
Antsa	10,100	7,600	9,900	9,640	8,975	10,150	10,101	66,466	8
Kyomango	6,976	5,220	5,762	4,785	5,552	5,450	6,250	39,995	6
Phase II	5,350	4,700	4,300	4,100	4,301	4,550	5,100	32,401	5
Rice mill	3,150	12,600	2,000	3,420	5,475	2,747	4,000	33,392	5
Tse-Kough	4,670	6,725	6,500	7,895	8,950	9,250	3,790	47,780	7
Bodanyi	3,759	4,100	4,250	3,745	4,953	4,676	3,675	29,158	4
Goh	3,101	2,895	4,000	2,671	4,150	2,520	2,900	22,237	3
Kper-anna	8,700	11,255	11,100	8,600	12,400	9,288	10,374	71,717	11
Agbaja	4,000	6,250	5,200	3,975	5,620	5,680	3,900	34,625	5
Orbiam	3,000	3,900	4,000	3,615	5,000	4,685	3,825	28,025	4
Onmbaasha	4,101	8,000	6,200	4,825	5,120	6,000	3,300	37,546	5
Total	92,212	109,145	104,662	90,344	102,121	103,591	97,355	699,430	100

Source: Researcher's field work, 2025

In terms of water use categories, the result reveals that washing (109,145 litres) had the highest overall daily demand, followed by toilet use (104,662 litres) and hygiene (103,591 litres), which together account for a significant share of total water consumption. This highlights the dominance of domestic needs such as cleaning and sanitation in household water use patterns. Bathing (92,212 litres) and kitchen activities (102,121 litres) also constituted substantial portions, reflecting their regular and essential nature. On the other hand, drinking water demand (90,344 litres), while critical, was lower than other uses, possibly due to the lower per capita volume required. The "others" category accounted for 97,355 litres, indicating a wide range of additional uses, including gardening and small-scale economic activities. Notably, Rice Mill recorded the highest water demand for washing (12,600 litres) despite its relatively low total water demand, possibly due to the nature of activities in the area.

The results therefore, demonstrate that household water demand in Naka is shaped by both geographical and socio-economic factors, with substantial variation across neighbourhoods and uses. High Level, Kper-anna, and Atsaha stand out as the most water-demanding areas, which may require targeted water management strategies to ensure adequate supply. Conversely, neighbourhoods such as Goh, Bodanyi, and Orbiam show relatively low consumption, potentially indicating unmet water needs or more efficient water use practices. The findings underscore the importance of integrated water planning that considers both spatial and functional dimensions of demand. This is particularly vital for future water infrastructure development, policy formulation, and sustainable management of water resources in Naka and its environs.

Pattern of Water Supply

The result of the Average Daily Water Supplied or Consumed (litres) in Naka is presented in Table 3. The result indicates that water demand and consumption vary significantly across neighbourhoods and water use categories, reflecting differences in population density, socio-economic activities, and access to water infrastructure. Among the neighbourhoods, High Level recorded the highest total daily water consumption (51,422 litres), highlighting its status as a densely populated and socio-economically active area with higher domestic water needs. This was followed by Kper-anna (44,350 litres) and Atsaha (40,700 litres), both of which exhibited substantial water demand, possibly due to larger household sizes and a higher concentration of economic and domestic activities. In contrast, Goh (15,703 litres) recorded the lowest water consumption across all uses, suggesting lower population density, reduced water access, or fewer water-dependent activities. Other neighbourhoods such as Rice Mill (20,971 litres), Bodanyi (20,508 litres), and Orbiam (20,314 litres) also showed relatively low consumption levels, reflecting variations in household demand, income levels, and infrastructure provision.

Table 3: Average Daily Water Supplied or Consumed (litres)

Neighbourhoods	Bathing	Washing	Toilet	Drinking	Kitchen	Hygiene	Others	Total
High level	6,370	8,000	7,375	8,677	5800	7,200	8,000	51,422
Atsaha	7,000	8,100	6,400	6,000	3,500	4,000	5,700	40,700
Atukpu	3,500	2,500	3,000	4,100	2,000	2,000	4,500	21,600
Kpankerke	6,000	5,500	4,300	4,000	5,000	6,600	3,700	35,100
Antsa	5,250	4,920	5,400	6,100	4,900	5,701	3,600	35,871
Kyomango	4,800	4,200	4,750	3,250	3,700	2,000	3,100	25,800
Phase II	3,400	4,000	4,170	3,200	3,000	3,700	3,000	24,470
Rice mill	1,890	1,600	2,201	2,730	3,000	2,000	7,550	20,971
Tse-Kough	3,260	4,225	2,250	4,795	4,500	5,000	3,601	27,631
Bodanyi	2,555	3,700	2,953	3,400	3,000	2,800	2,100	20,508
Goh	3,000	2,658	2,000	1,990	2,000	2,110	1,945	15,703
Kper-anna	6,200	8,400	6,700	5,200	6,550	7,000	4,300	44,350
Agbaja	2,000	3,000	3,000	5,000	3,000	3,300	3,000	22,300
Orbiam	2,150	3,964	2,500	4,000	3,700	2,000	2,000	20,314
Onmbaasha	3,000	5,000	2,600	4,700	4,000	4,500	6,000	29,800
Total	60,375	69,767	59,599	67,142	57650	59,911	62,096	436,540

Source: Researcher's fieldwork, 2025

A closer look at water use categories reveals that washing (69,767 litres) and drinking (67,142 litres) accounted for the largest shares of daily water use across Naka, emphasising their essential roles in domestic water demand. High Level led in drinking water consumption (8,677 litres), indicating both high household numbers and the importance of potable water needs. In contrast, bathing (60,375 litres) and toilet use (59,599 litres) were also significant components of daily demand, particularly in High Level and Kper-anna, where bathing needs reached 6,370 litres and 6,200 litres respectively. The hygiene and others categories, though lower in total volume, showed notable variations, with High Level and Kper-anna again exhibiting the highest usage, pointing to more extensive hygiene practices and diverse water uses. The lowest water consumption across most categories was recorded in Goh, where water use for drinking (1,990 litres) and toilet (2,000 litres) was particularly low, highlighting the extent of water scarcity or limited accessibility in the area.

The total daily water consumption across Naka and its environs stood at 436,540 litres, illustrating substantial water demand for domestic and household uses. The neighbourhood-level disparities highlight the spatial variability in water consumption patterns, influenced by factors such as settlement density, income levels, household size, and water supply reliability. The higher consumption in High Level, Kper-anna, and Atsaha underscores their greater dependence on waterintensive domestic and livelihood activities, while the consistently low consumption in Goh and similar neighbourhoods suggests challenges in water availability or infrastructural provision. These findings imply the need for targeted water resource planning and equitable distribution strategies to address disparities and ensure sustainable water supply across all neighbourhoods in Naka.

Level of Water Scarcity

The result of the deficit or scarcity in Naka is presented in Table 4, Figures 3 and 4. The result indicates significant variation in water demand, supply, and coverage across the neighbourhoods, revealing a widespread water scarcity challenge in the study area. Among the neighbourhoods, Atukpu (48.37%), Kpankerke (46.07%), and Antsa (46.03%) recorded the highest deficit percentages, indicating that less than 54% of their daily water demand is met. These high-deficit areas reflect severe water stress, likely due to insufficient infrastructure, limited water sources, or rapid population growth outpacing supply capacity. Conversely, Onmbaasha (20.63%), Phase II (24.48%), and Orbiam (27.51%) had the lowest deficits, indicating relatively better water supply situations where coverage ranges from approximately 72% to 79%. This disparity highlights uneven water distribution and access across neighbourhoods in Naka town (Plate 1).

A

B

C

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D

Plate 1: Dominant Household Water Supply Sources in Naka (A = Well; B = Vendor fetching water form Dam; C = Moody Water from Dam; D = Stream/River

Table 4: Demand, Supply, Deficit and Supply coverage

Neighbourhood	Demand (L/day)	Supply (L/day)	Deficit (L/day)	Deficit (%)	Supply coverage (%)
High level	80,800	51,422	29,378	36.36	63.64
Atsaha	68,370	40,700	27,670	40.47	59.53
Atukpu	41,835	21,600	20,235	48.37	51.63
Kpankerke	65,083	35,100	29,983	46.07	53.93
Antsa	66,466	35,871	30,595	46.03	53.97
Kyomango	39,995	25,800	14,195	35.49	64.51
Phase II	32,401	24,470	7,931	24.48	75.52
Rice mill	33,392	20,971	12,421	37.20	62.80
Tse-Kough	47,780	27,631	20,149	42.17	57.83
Bodanyi	29,158	20,508	8,650	29.67	70.33
Goh	22,237	15,703	6,534	29.38	70.62
Kper-anna	71,717	44,350	27,367	38.16	61.84
Agbaja	34,625	22,300	12,325	35.60	64.40
Orbiam	28,025	20,314	7,711	27.51	72.49
Onmbaasha	37,546	29,800	7,746	20.63	79.37
Total	699,430	436,540	262,890	37.59	62.41

Source: Computed from Table 8 and 9

A closer look at individual neighbourhood performance shows that Onmbaasha stands out as the least water-stressed area, with a supply coverage of 79.37%, indicating that the majority of its water demand is met. Similarly, Phase II (75.52%), Orbiam (72.49%), Goh (70.62%), and Bodanyi (70.33%) also show favourable supply coverage, suggesting the presence of more reliable water infrastructure or proximity to water sources. On the other hand, neighbourhoods like Atukpu (51.63%), Antsa (53.97%), and Kpankerke (53.93%) struggle to meet even 55% of daily demand, highlighting critical areas requiring urgent intervention. These areas likely face chronic water shortages, which could exacerbate health risks, reduce water security, and limit socio-economic activities.

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The general result reveals that Naka town experiences a total daily water demand of 699,430 L, while the actual supply is 436,540 L, leaving a deficit of 262,890 L. This represents an overall water supply coverage of 62.41% and a deficit of 37.59%, indicating that more than one-third of the population's water needs remain unmet. The pattern suggests that although some neighbourhoods have moderate water supply systems, a significant portion of Naka's population continues to face inadequate water access. This shortage poses substantial implications for public health, domestic use, and sustainable development. Addressing these gaps requires targeted infrastructure investments, improved water resource management, and equitable distribution strategies, especially in high-deficit areas, to ensure adequate and reliable water supply for all households in Naka and its environs.

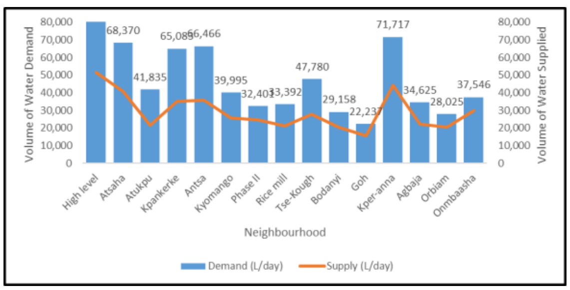

Figure 3: Average Daily Water Demand and Supplied in Naka

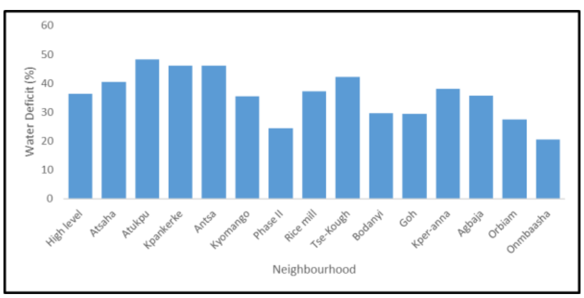

Figure 4: Average Daily Water deficit in Naka

Per Capita Water Consumption in Naka

The result of the per capita water consumption in Naka presented in Table 5 shows significant variation across the neighbourhoods, highlighting disparities in water supply and access. Neighbourhoods such as Bodanyi (54.1 L), Tse-Kough (51.3 L), Rice Mill (46.8 L), and Orbiam (81.3 L) recorded relatively high per capita water supply compared to the study area's average of 43.4 L per person per day. Notably, Onmbaasha (96.1 L), Agbaja (71.9 L), and Goh (173.9 L) significantly exceeded this average, suggesting either lower population pressure or better infrastructure and distribution systems in those locations. In contrast, Antsa (25.8 L), Phase II (32.3 L), Atsaha (32.6 L), and Kyormango (32.8 L) recorded the lowest per capita supplies, indicating possible infrastructural deficiencies, higher population density, or distance from water supply points. The variation in per capita supply illustrates that access to adequate water is unevenly distributed across the town, potentially leading to different levels of water stress and hygiene outcomes among residents.

The overall per capita water supply (43.4 L) is far below the World Health Organization (WHO) recommended minimum of 100 L per person per day, implying widespread water scarcity in Naka. This shortage has critical implications for public health, sanitation, and socio-economic wellbeing, as inadequate water availability can hinder household hygiene practices, food preparation, and disease prevention. Neighbourhoods with critically low per capita supply, such as Antsa and Phase II, may experience higher incidences of water-related diseases and spend more time fetching water, affecting productivity and quality of life. On the other hand, areas like Goh and Onmbaasha, which report significantly higher per capita values, likely benefit from improved water infrastructure, lower demand pressure, or proximity to water sources. The observed disparities underscore the need for targeted interventions such as the expansion of water supply infrastructure, equitable distribution strategies, and community-level water management programmes. Addressing these gaps will be crucial for achieving sustainable water security and improving living conditions across Naka.

Table 5: Per Capita Water Consumption in Naka

S/N	Neighbourhood	Household Population	Water Demand (litres)	Water Supplied (litres)	Per Capita Water Supply(litres)
1	High level	1500	80,800	51,422	34.3
2	Atsaha	1250	68,370	40,700	32.6
3	Atukpu	520	41,835	21,600	41.5
4	Kpankerke	1000	65,083	35,100	35.1
5	Kper-anna	1000	66,466	35,871	35.9
6	Antsa	1000	39,995	25,800	25.8
7	kyormango	745	32,401	24,470	32.8
8	Phase II	650	33,392	20,971	32.3
9	Rice mill	590	47,780	27,631	46.8
10	Tse-Kough	400	29,158	20,508	51.3
11	Bodanyi	290	22,237	15,703	54.1
12	Goh	255	71,717	44,350	173.9
13	Agbaja	310	34,625	22,300	71.9
14	Orbiam	250	28,025	20,314	81.3
15	Onmbaasha	310	37,546	29,800	96.1
	Total	10,070	699,430	436,540	43.4

Source: Computed from Table 8 and 9

Discussion

From the findings on patterns of water demand and supply, the study recorded a total daily water demand of 699,430 litres and a supply of 436,540 litres, indicating a 37.59% deficit. High Level recorded the highest demand (80,800 litres), while Goh had the lowest supply (15,703 litres). Washing (109,145 litres) and toilet use (104,662 litres) accounted for the largest portions of daily demand, while supply was skewed toward washing (69,767 litres) and drinking (67,142 litres). The results show spatial disparities in water availability and highlight the imbalance between domestic and infrastructural capacity across neighbourhoods. Similar outcomes have been reported in several studies. Ahmed et al. (2023) found a consistent demand–supply imbalance in Kaduna North, where supply deficits were attributed to rapid urbanisation and poor infrastructure maintenance. Joshua et al. (2022) in Gombi, Adamawa State, also documented uneven water distribution, where some wards received significantly less supply due to ageing pipelines and poor service coverage. Ihuoma et al. (2021) argued that such disparities stem from a historical neglect of small-town infrastructure in Nigeria's water policy framework. The present finding reinforces these observations by showing that despite the presence of boreholes and hand-dug wells, variability in yield and reliability of supply remains high. Consequently, households rely on multiple sources, which increases both the economic and health burdens of water collection.

The results also illustrate the persistence of seasonal water stress, especially during dry months when supply becomes more constrained. This aligns with Oyekale (2015), who demonstrated that rainfall seasonality significantly influences rural water supply reliability in Nigeria. The Naka case therefore epitomises a broader challenge where limited infrastructural investment and hydrological variability combine to create chronic shortages.

IV. CONCLUSION

The study concludes that water demand in Naka far exceeds the available supply, with an overall daily deficit of 37.59%, reflecting a substantial gap in access to safe and reliable water. Significant spatial disparities were observed, as neighbourhoods such as Atukpu, Kpankerke, and Antsa experience severe shortages, while areas like Onmbaasha and Orbiam have relatively better coverage. The consistently low per capita water supply, averaging 43.4 L per person per day compared to the WHO minimum of 100 L, demonstrates that most households face inadequate water access for basic domestic and hygiene needs. These findings suggest the urgent need for strategic water infrastructure expansion, improved maintenance, and equitable distribution to reduce neighbourhood-level inequalities. The dominance of water use for washing, toilet, and hygiene also underscores the importance of reliable water systems for health and sanitation outcomes. In general, the study affirms that Naka's current water situation poses a barrier to achieving SDG 6, which calls for universal and equitable access to safe and affordable drinking water by 2030. Strengthening water governance and investing in sustainable supply systems will therefore be critical to improving water security and supporting broader community wellbeing.

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