# Assessment of Domestic Water Demand and Supply in Maiduguri

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**Abstract**: *Water has been recognized as one of the most significant natural resources and crucial element for existence of all organisms. The increased in water demand couple with climate change and urbanization has imposed pressure on the scares water supply system, which has led to many urban issues specifically water scarcity. The aim of the study is to assess domestic water scarcity in Maiduguri with a view to understand the domestic water demand and supply in the study area. The study covered five words within Maiduguri metropolis namely:Hausari, Shehuri, Gwenge I, Gamboru and Gwenge II. The study employed quantitative techniques using instruments such as structured questionnaire. Data were collected through close-ended questionnaires and the collected data were analysed via descriptive statistics (frequency table). The results of the finding also confirmed that the total water demand of the respondents exceeded the total water supply. The study also found that, over 70 percent of the respondents water demand are not satisfied by the total water supply. As such, water per capita of the respondents below 50 litres per day as recommended by the united nation (2010). Finally, the study has concluded that water scarcity has noticed in the study area as their per capita is below 50 litres recommended by United nation (2010).*

*Keywords: Water, Demand, Supply, Domestic, Scarcity.*

## INTRODUCTION

Water scarcity according to Tatlock (2018), is unmet water needs. The World Business Council for Sustainable Development (2020), defines water scarcity as not enough water for all to uses. According to European Union (2020), water scarcity is a structural imbalance between the water needs and the water resources.

Global response to water scarcity is a paradigm to limit excessive water use (save water whenever possible) even in a country where water resources is not scarce. Although there have been a lot of water adaptation methods in sub-Saharan Africa to cushion effects of water scarcity or stress. United Nation Agenda 21, Rio Janeiro 1992, Earth submit adapted three frameworks for coping with water scarcity namely: integrated water sources management, water reuse and recycling method and climate preparedness programme.

Water scarcity is a major problem in Africa, especially in the sub-Saharan regions due to poor management of water supply and low- technical know-how. A Study conducted by Alayande (2018), revealed that water supply in developing countries is facing serious challenges, many of which are economic and socio-political in nature. Increase in water demand over the years in developing countries has made most existing water supply schemes insufficient in meeting the demand. Rapid development has also brought about increase in the domestic water uses, as houses are now with gardens, increased number of cars and water using home appliances.

This rapid growth in water demand has created imbalance between water demand and supply, in other words, water scarcity.

Maiduguri with its geographical location in sub-Sahara African, has similar issues of water scarcity that is related to inadequate water supply system and poor management techniques, as the city has been vulnerable to water deficit (Mustapha *et al,* 2012). As such, it places more people under water scarcity due to the limited water resources available.

**AIM AND OBJECTIVE OF THE STUDY**

The aim of the study is to assess domestic water scarcity in Maiduguri with a view to understand the domestic water demand and supply in the study area. This will be achieved through the following objective:

To determine the degree of variation for water demand and supply across the study area.

**METHODOLOGY**

This study employed quantitative research techniques using instruments such as structured questionnaire. Stratified random sampling was used to administer 346 households through close-ended questionnaires design, then the collected were analysed through the descriptive statistics (frequency table) And the results were presented in tables

**The Study Area**

Maiduguri Metropolis, a major city in the Northeastern corner of Nigerian, is located between latitudes 11Ö4'N and 11Æ4'N; and between longitudes 13Ö4'E and 13Æ4'E. It covers a total land area of 543 km2, which makes it the largest city in the Northeastern region of Nigeria (Daura, 2002). Maiduguri Urban now extends to four Local Government Areas (LGAs): Maiduguri Metropolitan, Jere, and Konduga and to a smaller extent part of Mafa LGAs. Maiduguri was founded in 1907 as a military outpost of the British and has since grown rapidly with a population exceeding 1.7 million by 2023.



MAP OF THE STUDY AREA
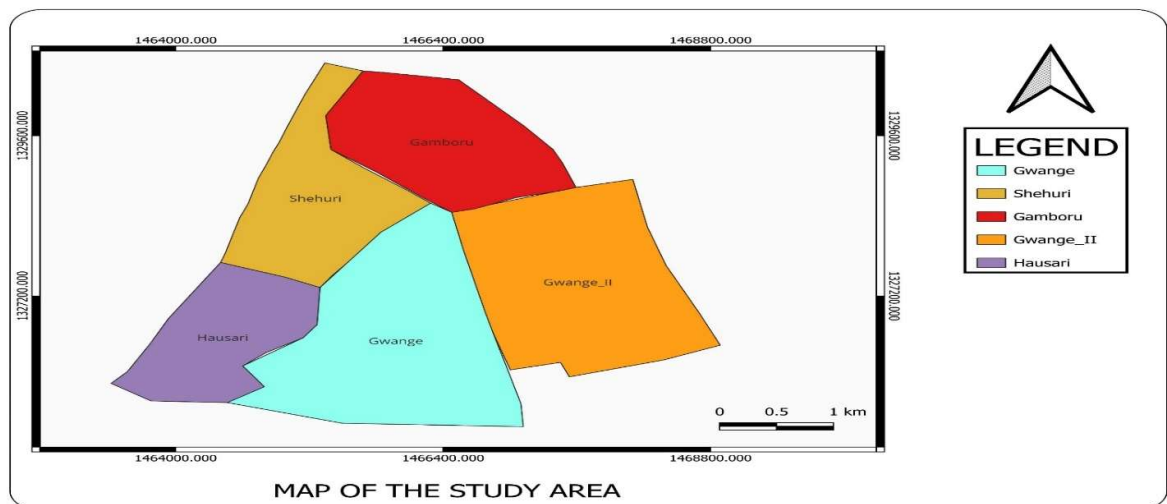
**Source:** Author (2023)

**RESULTS AND DISCUSSIONS**

**Sociodemographic profiles of the respondents**

| S/N | Socioeconomic Information | Option | Household number | percentage |
|---|---|---|---|---|
| 1 | Gender | Male | 242 | 70 |
|  |  | Female | 104 | 30 |
| 2 | Age | Under -30 | 78 | 23 |
|  |  | 30 – 60 | 160 | 26 |
|  |  | 60 Above | 108 | 31 |
| 3 | Income | Below 30,000 | 134 | 39 |
|  |  | 30,000-100,000 | 174 | 50 |
|  |  | Above 100,000 | 38 | 11 |
| 4 | Household Size | 1 – 4 | 226 | 65 |
|  |  | 5 – 10 | 104 | 30 |
|  |  | Above 10 | 16 | 5 |
| 5 | Marital Status | Married | 234 | 68 |
|  |  | Non-married | 112 | 32 |
| 6 | Education level | Tertiary | 101 | 29 |
|  |  | Secondary | 155 | 45 |
|  |  | Primary | 53 | 15 |
|  |  | No-formal education | 37 | 11 |
| 7 | Occupation | Civil Servant | 121 | 35 |
|  |  | Trader | 135 | 39 |
|  |  | Artisan/farmer | 90 | 26 |
| **Total** |  |  | **346** | **100** |

Source: Author, 2024

The results of table 7 revealed that 41% of the total water supply of the respondents is consumed by male while female consumed 59%. The table also shows that, respondents under 30 years consumed 28% of the total water supply, respondents age 30 – 60 years consumed 66%, while 6% consumed by respondents above 60 years. The finding also reveals that, 27% of total water supply consumed by respondents who earning below 30.000, 51% is consumed by those who earning 30,000 – 100,000 while 21% consumed those earning above 100,000. The table also confirmed that, 18% of total water supply is consumed by respondents with household size of 1 - 4 persons, 37% is consumed by respondents with 5 – 10 persons while 45% is consumed by household with 10 persons above. The results also show that, 75% of the total water supply is used by married respondents while 25% is used by non-married. In term of educational level, the finding of the study indicates that 48% of the water supply is used by respondents with tertiary education, 27% is used by respondents with secondary education, 17% is used by household with primary education while 8% is used by household with no formal education. The study also found that, 40% of total water supply is used by civil servant,

37% is used by traders and 23% is used by farmers/others.

Variation of Water Demand and Supply in the Study Area

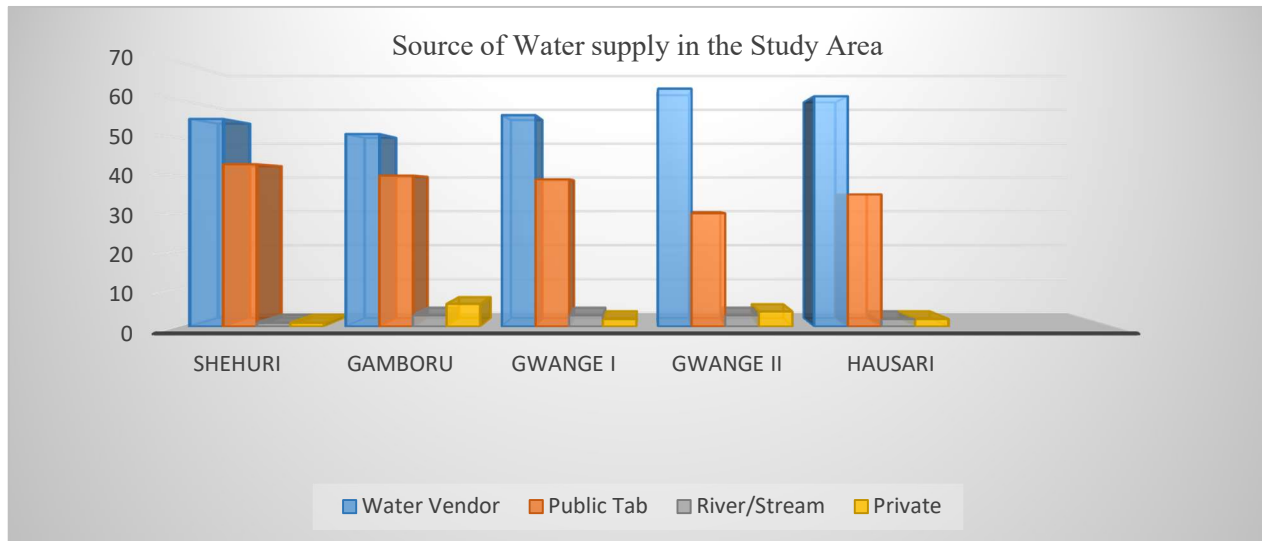| N/S | Wards | Number of Household | Average household size | Average Water Supply p/c/p/d | Meanwater Supply Per Household | Total Water supply | Average Water Demand p/c/p/d | Meanwater demand Per Household | Total water demand | shortfall | Percent of water demand satisfied by supply |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Shehuri | 60 | 4 | 26 | 104 | 6240 | 61 | 244 | 14640 | 8400 | 15.4 |
| 2 | Gamboru | 89 | 5 | 24 | 120 | 10680 | 60 | 300 | 26700 | 16020 | 29.5 |
| 3 | Gwange I | 52 | 4 | 21 | 84 | 4368 | 55 | 220 | 11440 | 7072 | 13 |
| 4 | Gwange II | 73 | 5 | 23 | 115 | 8395 | 59 | 295 | 21535 | 13140 | 24.1 |
| 5 | Hausari | 72 | 4 | 28 | 112 | 8064 | 62 | 248 | 17856 | 9792 | 18 |
| TOTAL | | 346 | | | | 37747 | | | 92171 | 54424 | 100 |

Source: Author, 2024

The result of table 13 indicated that total water demand and supply vary from one ward to another across the study area. As shown in the table Gamboru and Gwange II have highest water demand of 16020 and 13140 litres per day while the supply 10680 and 8395 respectively. This created shortfall of 29160 litres per day in the areas. The situation is similar in Shehuri and Gwange I where demand stands at 14640 and 11440 while 6240 and 4368 respectively. This study has found that, the resident's water per capita in the study area did not meet requirement of 50 litres recommended by the United Nation (2010). The average water supply of the residents below 30 litres per day which implies that the degree of the water scarcity is absolute.

**Figure 1: Source of Water supply in the Study Area**
**Source:** Author 2024

Figure 6 indicated that, on average 57.2% sources of water supply across the study area depend on water vendor, 37.4% depends on public tab, 3% depend on private source while 2.4% depend on river/stream. The reason for high dependency on water vendors is because of high cost of drilling personal borehole or wells in Maiduguri as well as avoiding unnecessary queue at public water points. As for the those who cannot afford to buy water from water vendors has no choice but to joint public water point for their daily activities
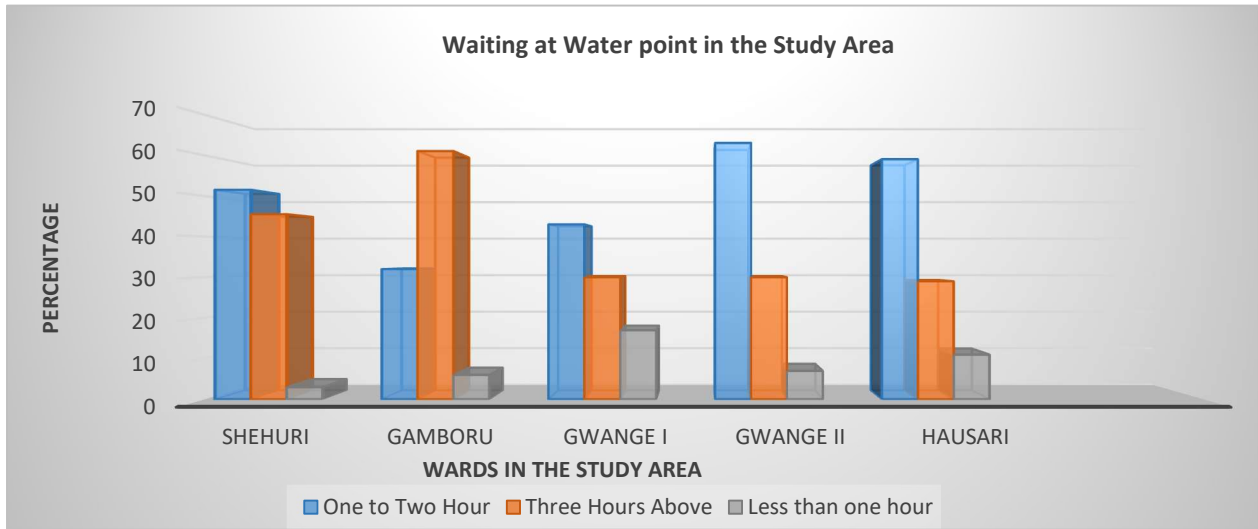
**Waiting at Water point in the Study Area**

*(Bar chart showing PERCENTAGE on the y-axis (0–70) versus WARDS IN THE STUDY AREA on the x-axis: SHEHURI, GAMBORU, GWANGE I, GWANGE II, HAUSARI. Legend: One to Two Hour (blue), Three Hours Above (orange), Less than one hour (grey).)*

**Figure 2: Waiting at Water point in the Study Area**

**Source:** Author 2024

Figure 8 revealed that, on average 50% of the respondents across the study area wait water at taps from one to two hour, 40% wait for three hours above while 10% wait for less than one hour. This research has learned that, planning standard for Queuing/waiting water has violated. According to the Omole and Longe (2017) "Queuing time at a water source is no more than 15 minutes
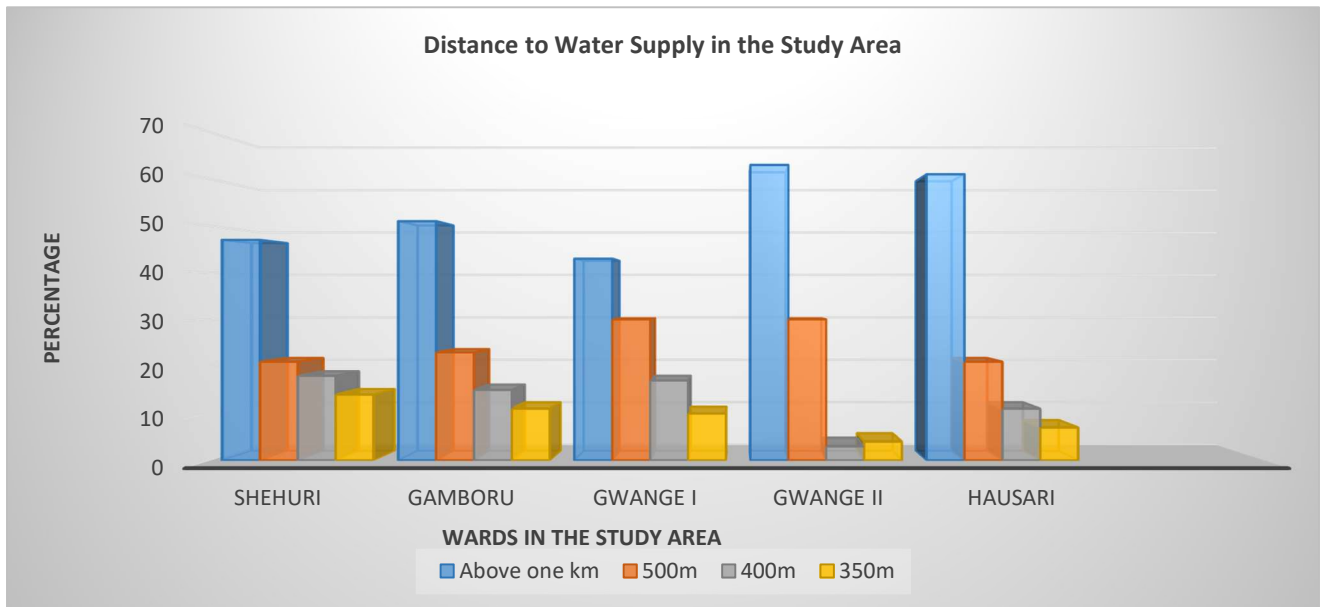
**Distance to Water Supply in the Study Area**

*(Bar chart showing PERCENTAGE on the y-axis (0–70) versus WARDS IN THE STUDY AREA on the x-axis: SHEHURI, GAMBORU, GWANGE I, GWANGE II, HAUSARI. Legend: Above one km (blue), 500m (orange), 400m (grey), 350m (yellow).)*

**Figure 3: Distance to Water Supply in the Study Area**
 **Source:** Author 2024

Figure 8 result shows that, on average 53% of respondents across the study area travel above one kilometre to get water, 25% travel 500 metres to get water, 13% travel 400 metres and 9% trek 350 metres to get water for daily activities. This study has learned that, planning standard for household distance to water points has violated. According to the Omole and Longe (2017) "The maximum distance from any household to the nearest water point is 300 metres"
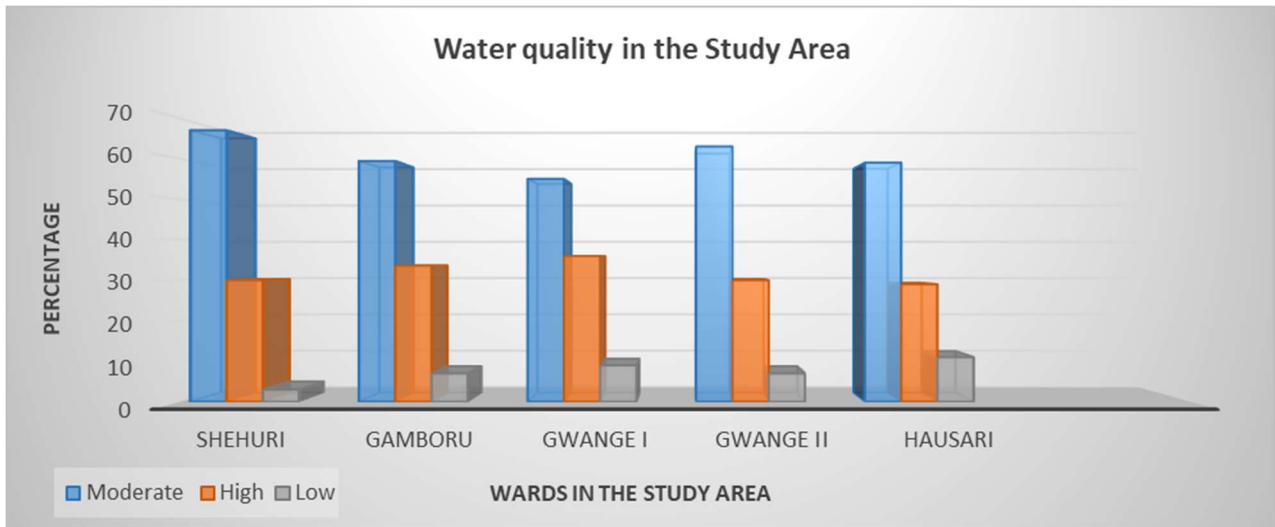


**Figure 4:** Water quality in the Study Area
**Source:** Author 2024

Figure 9 indicates that, on average 61% of the respondents across the study area agreed that the water quality is moderate, 32% agreed that the water quality is high while 7% replied that the water quality is low. This is due to fact that Maiduguri water table was deeper consequently leading to good water quality. A study conducted by Musa and Bukar (2023) on Water quality assessment in Maiduguri has reveal that, "the pH of all water sample was within the range of 6.5 to 8.5 as recommended limit by world health organisation (2010)
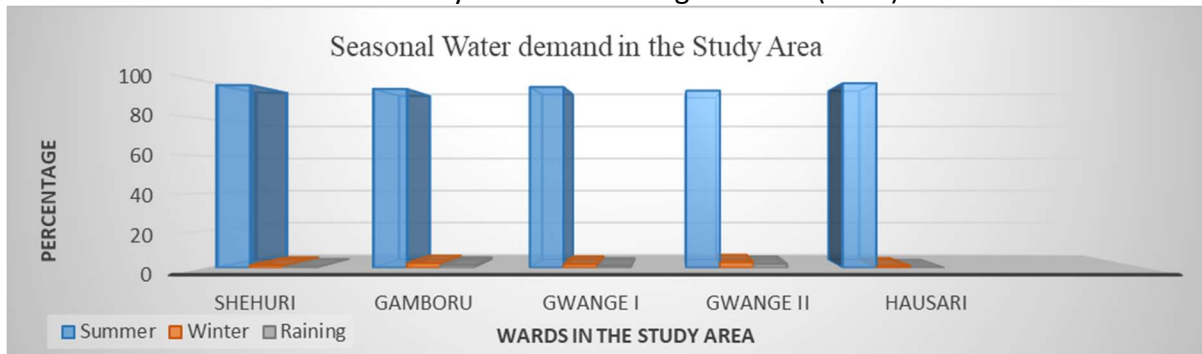


**Figure 5: Seasonal Water demand in the Study Area**
**Source:** Author 2024

Figure 10 revealed that, on average 97% of the respondents across the study area demand more water during summer season, 2% during winter season and 1 during raining season
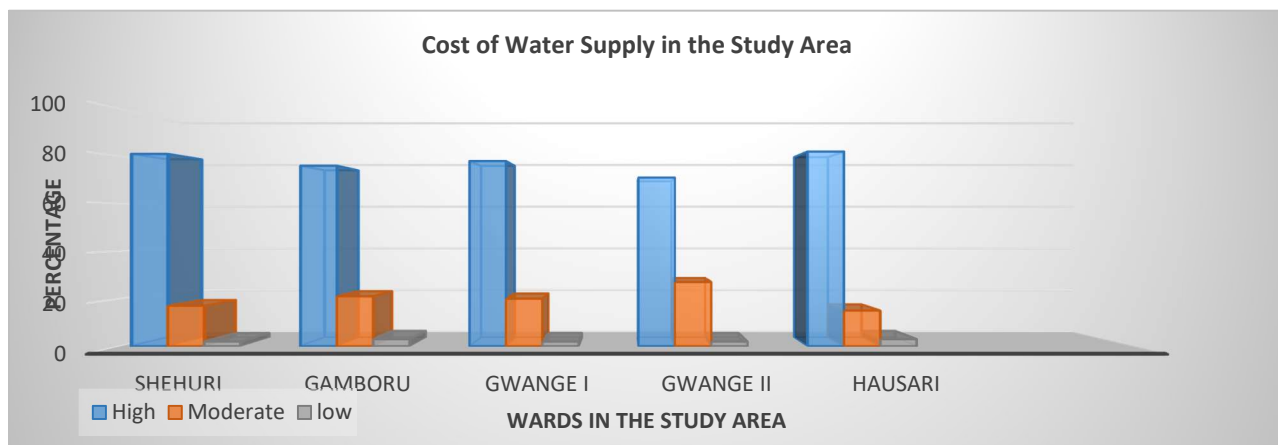


**Figure 6: Cost of Water Supply in the Study Area**
**Source:** Author 2024

Figure 11 above indicated that, on average 78% of the target respondents across the study area agreed that cost of water supply is high, 20% agreed is moderate while 2% agreed that is low.
**Conclusion and Recommendations**

### Conclusion

Based on the finding, this study concluded that, the finding of the research also confirmed that, the total water demand of the residents exceeded the total water supply. The study also found that, over 70 percent of the resident's water demand are not satisfied by the total water supply. As such water per capita of the residents below 50 litres per capita as recommended by the united nation (2010)

### Recommendations

Based on the findings of the research, the following recommendations are made:
Government should increase sources of public water supply availability to against the resident's dominant dependent on water vendors and queuing at water points in the study area. Government should also engage in water subsidising project, maintenance and management culture for all water supply infrastructures such as dams, reservoir and piping network. This will enhance the availability of the water supply and minimize the cost of water supply in the study area.

## REFERENCES

Alayande, A. W. Water Demand Management. Paper presented at a workshop titled: Urban Water Supply Facilities Maintenance held at National Water Resources Institute, Kaduna Nigeria, November 7th – 18th 2018.

Daura, M.M., Gisilanbe, A.M. and Waziri, M. (2001) Flood Plain Encroachment and Hazard Awareness. Faculty of Social and Management Sciences, University of Maiduguri, Maiduguri, 50-60.

Mustapha & Nelson, K. L. (2012). Intermittent water supply: prevalence, practice, and microbial water quality. *Environmental science & technology*, *50*(2), 542-553.

Omole, D. O., & Longe, E. O. (2017). An assessment of the impact of abattoir effluents on River Illo, Ota, Nigeria.

Tatlock T ( (2018). Survival analysis of water distribution network under intermittent water supply conditions. *Water Supply*, *20*(8), 3531-3541.

UN. (2010). *Water | United Nations*. the United Nations. Retrieved January 18, 2023, from https://www.un.org/en/global-issues/water

WBCSD, (2006). Drivers of business behaviour in the realm of sustainable development: The role and influence of the WBCSD, a global business network. *A Handbook of Globalisation and Environmental Policy: National Government Interventions in a Global Arena*, 313.

World Health Organization. (2019). *Progress on household drinking water, sanitation and hygiene 2000-2017: special focus on inequalities*. World Health Organization.