Assessment of Water Use across different Wards in Minna Town, Niger State, Nigeria

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Abstract

Water is an important resource on the surface of the earth. Some areas however have low supply and consumption of water than the others. In some cities across the world, water scarcity has become a serious challenge which residents undergo on daily basis. Therefore, this study investigated water consumption across different wards in Minna Town, Niger State, Nigeria. The study used multistage cluster sampling methods of different wards where 400 questionnaires were administered and interviews conducted. The result showed that most residents in Minna Town used the water supply for domestic purposes than industrial and agriculture purposes. Kpakungu (17.8%) had the highest domestic use of water. However, Limawa B, Soje and Kpakungu with 12.5% each were the three wards with the highest rates of industrial water consumption. Nasarawa B (29%) and Soje (15%) had the highest consumption of water supply for agricultural purposes. It was found that high density areas had the highest consumption rate of water and the Chanchaga Water Board could not adequately supply the required quantities of water for Minna residents. Therefore, the study has recommended that the government and city planners should improve water supply, develop and enforce a good water management framework that will meet the water needs of Minna residents without further delay.

Keywords: *Assessment, Consumption, Supply, Water, Wards*

Introduction

Water is an essential resource needed by all living things on the surface of the earth. Water plays a vital role in all natural processes and very important in physical, chemical and biological conditions. Water is one resource that is renewable as it has a recycling process that renews it for domestic uses. Although 70% of the surface of the earth is occupied by water, only 2.5% of the entire water is fresh water and only 0.3% is available for human use [1]. Thus, pressure is high on the use of water due to overpopulation, industrialization and urbanization challenges. Also, it is estimated that humans appropriate 54% of all the accessible freshwater contained in rivers, lakes and underground aquifers and by 2025 this will increase to 70% [1]. It is obvious that most human activities involve the use of water in various ways. That is the reason the early habitation of man and civilization started along the river banks. However, of the 3% of fresh water on the earth surface, 75% is tied up in glaciers and polar icebergs, 24% in groundwater and 1% is available in the form of fresh water in rivers, lakes and ponds suitable for human consumption [2].

There is high demand of water in the last century due to population explosion and industrialization. Thus, a considerable quantity of available water is polluted by polluted by sewage, industrial waste and a wide range of synthetic chemicals. However, fresh water that is precious to man needs to be protected and conserved by man. Unfortunately, such is not the case as man has seriously polluted the lakes, rivers and streams across the world [3]. Water is needed and used by almost all forms of life. The use of water by man can be classified into domestic, irrigation and industrial uses. The domestic water is used for drinking and the daily activities of man such as cooking, bathing, washing clothes, house and cleaning. The average adult human needs two to five litters of potable water per day to maintain the body fluid and to properly perform its physiological functions [4]. Other uses of water are for irrigation and industrial purposes. The per capital use of water if influenced by many factors such as availability of supply, socio-economic condition, cultural, hygiene habit, climatic condition prevalent in the area.

It is very important to maintain a safe drinking water in order to control the outbreak of diseases such as diarrhea, cholera, typhoid as 80% of all diseases in the world are associated with unsafe water [5]. Thus, any water of good physical, chemical and biological quality is considered useful in conserving the health of people. Such good water should be free of contamination and be supplied to the people. Water contamination occurs during leaching of toxic metals in both surface and ground water. Therefore, it is important to consider the standard methods of analyzing drinking water before use so as to avoid some health implications. In Nigeria and especially in Minna Town, population growth and urbanization are taking place with rapid speed. Many households are resorting to other alternative water supplies and uses of water. These have posed a great challenge to the health of the city dwellers. Therefore, this study is to assess the distribution of water consumption across different wards in Minna Town, Niger State, Nigeria in order for city planners to have information for their management framework on water supply and uses in the area.

Methodology

Minna Town is located within latitude $9^0$33”00 and $9^0$39”00 and longitude $6^0$30’00” and $6^0$39’00” GMT (Figure 1). The city covers 76,363km^2 representing 8% of the total land area of Nigeria. In Minna Town 85% of the land is arable made of short and scattered trees and vegetation. The soil is predominantly light and well drained. The city experiences distinguished wet and dry seasons having rainfall of 1,100mm in the northern part to 1,600mm in the southern segment annually. The temperature ranges from 23^0C to 37^0C with relative humidity of 40%. The dry season begins from November and ends in March and the raining season starts in April and ends in October of every year.

This study adopted the multi-stage cluster sampling technique where the first stage was the random selection of wards and the second state was the random selection of the communities in the wards and final stage was the random selection of the households which the questionnaires were sampled. This study used questionnaire instrument to generate data for analysis. The questionnaire was developed in two sections of respondents’ bio-data and domestic water consumption rate. The interview and questionnaire were guided by indigenes who knew the native language. The respondents were people from 18 years and above of both men and women from all work of life such as farming and trading. The field work was carried out in 6 months (November 2022 to April 2023). The Cronbach’s coefficient alpha reliability value was at 0.06 as the established reliability indicator for the questionnaire instrument used. This study administered the questionnaire and participatory interviews in 11 clusters of Makera, Limawa A, Limawa B, Nasarawa A, Nasarawa B, Soje, Minna Central, Kpakungu, Barkin Sale, Sauka-kahuta and Bosso respectively. Thus, 36 questionnaires were sampled in the 11 clustered wards where 18 households were randomly random selected totalling 396 questionnaires. The remaining 4 questionnaires were randomly administered in the study area making it a total of 400 respondents. In order to determine the sample size, the Taro Yamane (1973) formula was adopted; stating n = N/1 + N(e)2 by considering it with 95% confidence level; where “n” denotes the sample size and “N” denotes the number of people in the total population and “E” denotes the allowable error (%) bringing it to a total of 400 respondents in the clusters. The Statistical Package for Social Sciences (SPSS) was used to analyze the data and represented in table.

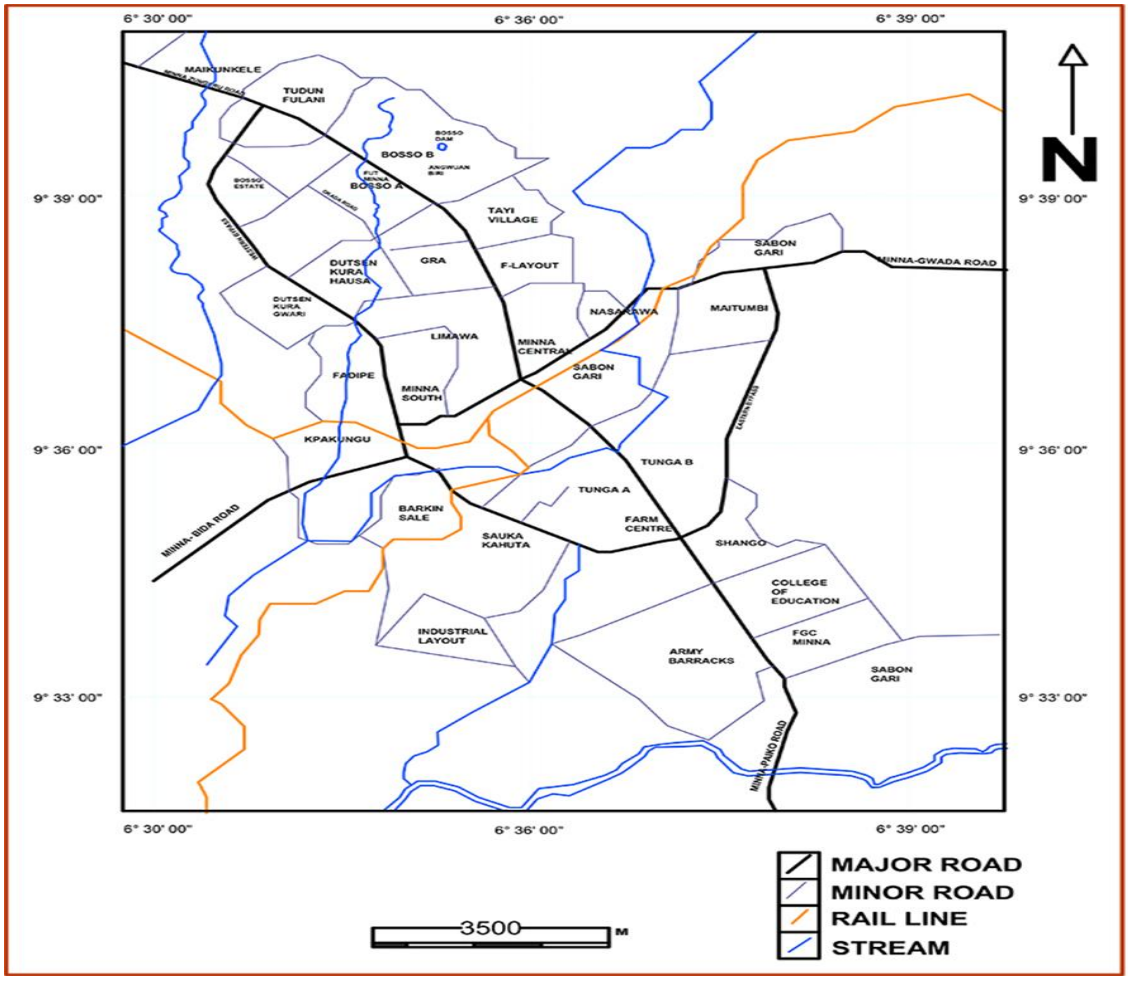

Figure 1: Area Map of Minna Town

Results and Discussion

Table 1 showed that many households in the area required water for domestic purposes on a regular basis than for agricultural and industrial uses. Kpakungu had the highest percentage of 17.8% while Soje and Bosso had the lowest percentage of 5.2% each on domestic consumption. For industrial consumption rate, Limawa B', Soje, Kpakungu and Sauka-kahuta had 12.5% each and Nasarawa B' had zero rate of industrial consumption. Nasarawa B' consumed more water on agriculture while Makera, Limawa A' and Nasarawa A' had zero consumption rates on agriculture due to poor farm gardens in the area. The result showed high use of domestic water seconded by industrial use and the least by agricultural purposes. It indicated that residents in Minna town were less users of water for agricultural purposes such as irrigation but depended on the use of water for drinking, bathing and coking purposes as well as for industrial productions.

Table 1: Distribution of Type of Water Use across different Wards in Minna Town

S/N	Wards	Domestic Water Use	Industrial Water Use	Agriculture Water USe
1	Makera	5 (4.4%)	15(7.5%)	-
2	Limawa A	15(13.3%)	20(10%)	-
3	Limawa B	14(12. 5%)	25(12.5%)	10(11.7%)
4	Nasarawa A	6(5.3%)	15(7.5%)	-
5	Nasarawa B	10(8.9%)	-	25(29%)
6	Soje	16 (14.2%)	25(12, 5%)	15(17.6%)
7	Minna Central	10(8.9%)	20(10%)	5(5.8%)
8	Kpakungu	16 (14.2%)	25(12.5%)	15(17.6%)
9	Barkin Sale	6 (5.3%)	15(7.5%)	5(5.8%)
10	Sauka-kahuta	8(7.1%)	25(12.5%)	5(5.8%)
11	Bosso	7 (5.3%)	16(7.5%)	6(5.8%)
	Total	**113**	**201**	**86**

According to [7] in Joinville, Southern Brazil which showed that the average per capita consumption was 143.67 L/person/day, while the average household monthly water consumption was 14.53m³/household/month. The study proved that socioeconomic conditions such as number of residents, income and presence of children in the household showed an effect on water consumption. Others were building age and typology, number of bathrooms and presence of a bathtub and a swimming pool. The domestic household water consumption was highest than industrial and agricultural purposes in both studies. Similarly, [8] investigated water use pattern in Ilorin, Kwara State, Nigeria. The study adopted questionnaire survey and oral interview which centered on water demand and use. It was unfolded that domestic water use was highest compared to institutional, commercial and Industrial uses. However, most residents were found to use between 46 to 115 l/c/d. The study showed that the low density areas used lesser quantities of water than high density areas. It was found that the public water supply was inadequate as majority of consumers still source water from wells or boreholes to meet their basic domestic needs.

Conclusion

This study looked at distribution of water consumption across different wards in Minna Town, Niger State, Nigeria. From the questionnaires conducted, it can be deduced that most residents in Minna Town used the water supply for domestic purposes than industrial and agriculture purposes. Thus, Kpakungu had the highest domestic use of water. However, Limawa B, Soje and Kpakungu were the three wards with the highest rate of industrial water consumption. Nasarawa B and Soje

had the highest consumption of water supply for agricultural purposes. The result showed that high density wards had higher consumption of water supply than those with low density. The finding showed that the public water supply from the Chanchaga Water Board could not adequately supply water to the household thereby some residents resorted to the use of well water, borehole and stream waters as alternative water supply. It is recommended that the government and planners should develop and enforce effective water management framework without further delay in Minna Town, Niger State, Nigeria in order to cushion the hardship the residents undergo due to poor water supply and consumption.

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