Gombe Journal of Geography and Environmental Studies (GOJGES)

Vol. 2 No.3 Jun. 2022

e-ISSN: 2714-321X

p-ISSN: 2714-3201

http://www.gojgesjournal.com

Gombe Journal of Geography and Environmental Studies (GOJGES) Vol. 2 No.3 Jun. 2022, e-ISSN: 2714-21X; p-ISSN: 2714-3201

ASSESSMENT OF HOUSEHOLDS' VULNERABILITY TO WATER SCARCITY IN FUNE LOCAL GOVERNMENT AREA OF YOBE STATE, NIGERIA

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Abstract

Access to safe, portable and adequate domestic water is an essential human right, emphasized in the public policies, treaties and constitutes huge challenges to water-scarce regions such as the semi-arid Nigeria. This region is an environment of variable rainfall, intense water scarcity due to lack of water infrastructure, increasing populations, extreme poverty and high occurrence of extreme climatic events, which adversely affect the socio-economically disadvantaged population. Thus, this study examined the relationship between domestic water scarcity variables and socio-economic characteristics of households in Fune Local Government Area of Yobe State, a rural semi-arid State of Nigeria. Stratified and systematic-random sampling techniques were used to generate the study data. The data were then summarized using basic descriptive statistics, while relationship among households' socio-economic characteristics and domestic water scarcity variables were examined using inferential statistics. The result revealed that there is a common reliance of households on unimproved water sources, while water collection for households' use is usually shouldered by women and girls. The daily water availability is grossly short of the demands, revealing vulnerability to scarcity. The correlation test of households' characteristics and domestic water scarcity variables showed that household income is positively but insignificantly related with water availability for households use, while household size is perfectly but negatively correlated with water availability, educational status of household head is positively correlated with water availability. Finding a lasting solution to water scarcity in the area require increased budgetary allocations to and investments in rural water supply sector and sustained management of the water facilities for the communities by Government, international development partners and relevant institutions for improved households' livelihoods, income and reduced poverty in the area.

Keywords: Households, Socio-economic, Scarcity, Vulnerability, Water

1.1 Introduction

Water is an essential natural resource for human well-being and socio-economic development; hence its access has been recognized as a human right and emphasized in the ambitious United Nations Sustainable Development Goals (SDGs). The safe and adequate supply of the limited freshwater resources is important for diverse aspects of social and economic development. Lukman et al. (2016) opined that access to potable water is measured by the number of people who have reasonable means of getting an adequate (quality and quantity) amount of water that is safe for domestic activities. The United Nations (2020) reported that 785 million people live without access to basic drinking water service and 700 million are likely to be added in the next decades. Similarly, Olalekan et al. (2019) discovered nearly 2.4 billion people live in such regions and by 2050 half of the world could stand at high risk of water stress –increasing the water scarcity refugees. With these facts, the ambitious SDG 6.1 100% coverage may be highly uncertain, particularly with widening socio-economic disparities, locations factor and COVID-19 ambush. Moreover, the 836 million living in extreme poverty, 56% of whom from sub-Saharan Africa (United Nations, 2020) points to a more complex situation in the world. By 2023, the global population is expected to reach 8

billion and the continuation of economic development activities would naturally increase the pressure on the earth's finite freshwater resources (Olalekan et al., 2019). Despite the World Bank (2020) report, which highlighted increased access to basic water supply between 2010 and 2018 from 61% to 68% at the national level, 46% to 60% in the rural areas, the only negligible fraction has complete access to WASH service. Olalekan et al. (2019) added that the rural population of Nigeria was neglected in water supply service despite being essential for the maintenance and promotion of public health and economic productivity. This led to the prevalence of water-borne diseases, contributing to higher rates of infant mortality, under nutrition, stunting, inflammation; impair cognitive functioning and physical development, lowers productivity and wages (World Bank, 2020). Consequently, as billions of people continued to be deprived access to water supplies, the menace of those suffering from it remained higher. For instance, many people, especially children, die each year from access to contaminated water – about 95% of these deadly diseases are associated with the consumption of liquid content, while over 25 million Nigerians are diagonized to die from highly chemicalized products (Olalekan et al., 2019). Immensely disturbing, the situations could be that in agrarian communities of Yobe State, most population lives with a high possibility of intense water scarcity and poverty incidences. Moreover, the biasness of studies on domestic water supply in the Sahel region of Nigeria (Ngohi, 2011; Orounye, Ngamdu & Kura, 2012; Babagana et al., 2018) have led to huge data gaps for planning for sustainable socio-economic development in the rural areas of this dry land due to insufficiency of relevant scientific investigations. It's against this background that this study examines if household's-economic variables (the household size, toilet facility, and household head education and income levels) can be used to explain households' vulnerability to domestic water scarcity among the rural semi-arid Yobe State, Nigeria.

It is an area of water scarcity characterized by low and highly variable rainfall with an annual average of 250mm and a continuous decline in water availability, due to lack of water infrastructure, increasing populations and climate change. Babagana et al. (2018) opined that it only rains for about 120 days usually from June to September, and Fune Local Government Area is an extraction of the Yobe State landmass (45,502km²) that formed part of the Sahel. It falls between latitude 11º 53'N to 11º 88'N and longitude 11º 54'E to 11º 90'E (figure 1). It has a total landmass of 4,985km² and a population density of 78 persons per km² (NPC, 2017). The area is characterized with water supply challenges with and dry climatic conditions – the hottest months being March, April and May, and the temperature ranges between 30^0C to 42C during these months (Babagana et al., 2018). The soil of the area is mostly sandy in nature and loose in texture, highly erodible, though supports the cultivation of crops such as millet, sorghum, beans and groundnut as well as livestock rearing.

2. Methodology

Questionnaire survey and focus group discussion (FGD) were the two key survey methods used to obtain the required data. The target population was the rural communities of Fune Local Government Area of Yobe State, Nigeria. In the case of households' survey, multistage and systematic- random sampling procedures were followed. The study area was divided into three geological units- the Chad Formation, Kerri-Kerri Formation and Fika Shale interval, a random start was established and households were then systematically selected (table 1). However, one focus group discussion

was held in one community per geological unit (inDaura Kafaje and Guringu).

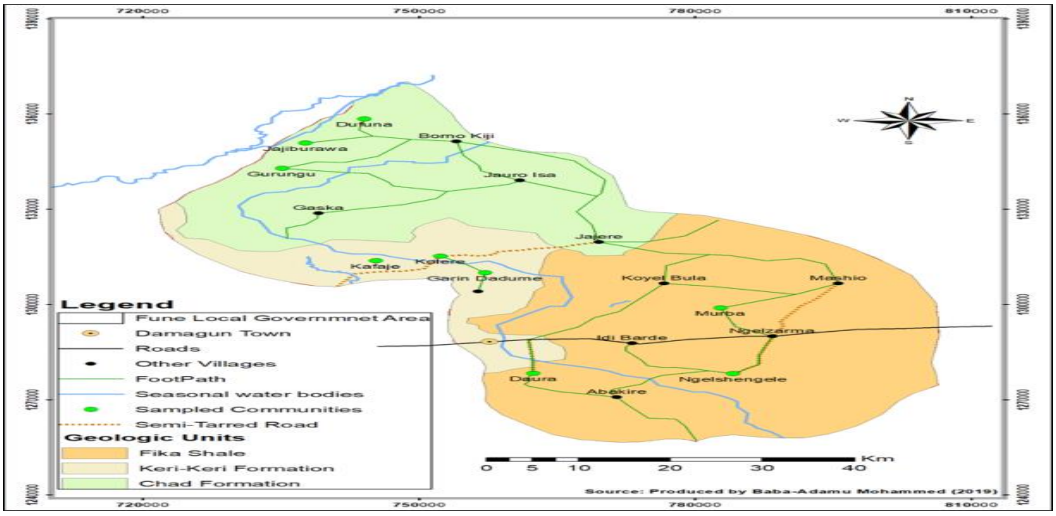
Two of the discussion groups consisting of 10 household heads each (i.e, 10 in Daura and 10 in Kafaje), while discussion was held with only 7 household heads in Gurungu. The data obtained through the FGD was used to complement the survey data for the analysis and discussion of result. The questionnaire survey data was analysed using descriptive and inferential statistical techniques and tools, while content analysis of the FGD data was carried out. These statistical models have shown capacities to describe similar data in previous studies (Abubakar, 2019; Lukman et al., 2016).The correlation model assumed that r= $\frac{n\sum xy - \sum x \sum y}{\sqrt{n\sum x^2 - \sum(x)^2}\sqrt{n\sum y^2 - \sum(y)^2}}$; *Where: n = study population; x = independent variables (household size, income, education and sanitation facility; y = dependent variables (water availability, demand and scarcity vulnerability).*

The domestic water consumption (availability, demand and vulnerability to water scarcity) were subjected to linear correlation analyses with the studied households' social and economic characteristics such as household size, education, income and sanitation facility. This helps to assess the relationship of the variables and degree of association for proper planning and development.

Table1. Sample Frame and Size for the Selected Communities

Study Zones	Sampled Communities	Longitudes	Latitudes	No. of Households	Sampled Households
Fika Shale	Daura	11.405567	11.553658	183	31
	Murba	11.504024	11.660501	243	41
	Ngelshengele	11.60465	11.550527	201	34
Kerri-Kerri Formation	Dadume	11.360187	11.839857	69	13
	Kafaje	11.251558	11.918324	99	16
	Kolere	11.286100	11.882700	165	28
Chad Formation	Dufuna	11.182238	12.257496	303	51
	Jajiburawa	11.148437	12.215455	165	28
	Gurungu	11.068409	12.13727	207	35
	Total			1635	277

Source: Fieldwork (2019)



3. Results and Discussion

3.1 Households' Demographic Characteristics

Age is a demographic variable that is likely to influence access and consumption of water. The household heads in the age bracket of 18 to 45 years constitute 40.6%. This category of the population are not only in the active period of their lives but are also likely to have high water demand for various domestic activities such as washing and bathing, with an increased likelihood of influencing water scarcity. Household's heads in the middle to old age (59.4%) pay seems to pay less attention to personal hygiene and may therefore have lower water consumption and invariability less vulnerable to water scarcity.

There are more male-headed households (83.2%) in the area. This high dominance of the male headed households in the study area is similar to observation of Ogunbode and Ifabiyi (2014) in Osun state, Nigeria, in which case, most of the households are female-headed. However, this observation disagreed with Inkani (2015) findings of very uncommon female-headed households in northern Nigeria due to socio-cultural reasons. While domestic activities are primary responsibility of women, headship and decisions regarding most domestic activities, including water sourcing, are men's business. However, it was also observed that domestic water collection in the study area is basically gender-biased. Women primarily bear the burden of the activities in this area.

In terms of marital status, significant proportions (83.5%) of household heads are married. This characteristic has influence households' decision and resource allocation for domestic water and hence access to domestic water supply. On the other hand, religious beliefs are one of the demographic variables that may influence domestic water consumption, especially among Muslim households. For instance, significant proportions (98.7%) of the studied population are Muslims, who performs some religious obligations using water, which invariably increase households' water consumption. Such potential increase in water consumption due to religious background could increase exposure of the households to water scarcity.

3.2 Water Sources and Availability in the Area

The sources of domestic water supply relied upon for daily uses in the study area include hand dug-wells (63.2%), boreholes (29.2%) and surface waters, water vendors (7.6%) (see Table 3.1). On the basis of the joint monitoring programme (JMP) of the WHO/UNICEF (2013) classification, borehole facility is associated with improved water sources while the unprotected hand-dug wells and surface water bodies are classified as unimproved water sources. This suggest that about 70% of the population are dependent on unimproved water sources, despite the so-called commitments of Governments and development partners towards ensuring access to portable, safe and adequate water supply. As a result, vulnerability of the households to water scarcity is likely to be high in response to the low water yields of the unimproved water sources. In this area, the water conveyance from these sources is a responsibility shouldered by the children (46.9%), women (33.6%), men (14.4%) and the elderly (5.1%). This aligned with findings of a study by Bukar and Daura (2015) that domestic water provision is a culturally assigned responsibility on women and children. This proved the gender biasness of the domestic chore, and vulnerability to water scarcity.

Table 2. Water Sources, Demand and Provision

Index	Variables	Frequency/Proportion
Water Sources	Hand Dug-Wells	175 (63.2)
	Boreholes	81 (29.2)
	Others	21 (7.6)
Responsibility for Water Collection	Children	130 (46.9)
	Women	93 (33.6
	Men	40 (14.4)
	Others	14 (5.1)
Mean Water Volume (in Litres)	Average Household Water Availability	178
	Average Household Water Demand	374
	Per Capita Water Availability	16
	Expected Per Capita Water Sufficiency	30

Source: Fieldwork, 2019

The average household's daily water demand was 374 litres against 178 litres accessible per day, while the per capita availability stands at 16 litres/person/day in the face of expected sufficiency of 30 litres/person/day. It could be observed that only about half of the water demands, at both household and per capita levels, are met. This demonstrates a statistically large shortfall in the sufficiency volume of water in the area. These may be attributed to their socio-economic status of the population. It also proved the incapability of the Rural Water Supply and Sanitation Agency (RUWASSA) to meet up with its sole responsibility, which resulted in the use of varying local mechanisms to cope with the problem of domestic water supply in the study area. These strategies include reduction in domestic water uses, deepening of dug wells, rainwater harvesting and conservation.

3.3 Relationship between Select Households' Socio-demographic and Water Scarcity Variables

Household size and water consumption

Household size is perfectly negatively correlated with the per capita water availability (n = 277, α = 0.05, p-value = .271, r = -.066 in table 3). An increase in households' size by one person will leads to a consequent decrease of 6.6 litrers of water consumption by household. However, an association between water demand per head and the household size is perfectly positive and statistically significant at 99% degree of confidence (n = 277, α = 0.01, p-value = .009, r = .157** in table 3). This revealed that increase in household size by one person will results in a consequent increase in the demand for water by 15.7 litres per day. Increase in the water demand is statistically large as it represents more than 50% of the per capita water sufficiency (YSWSSP, 2010) for the rural areas of Yobe State. Similarly, the linear correlation between the household size and vulnerability to water scarcity showed a perfect negative relationship at 99% degree of confidence (n = 277, α = 0.01, p-value = .000, r = -.644** in table 4.7). This implied that the household's vulnerability to water scarcity is largely influenced by the size of the household. By this result, increase in household members by 1 person will leads to a decline in the water available to a household by 64.4 litres. Consequently, this may result in high exposure of household members to low water availability and hence water scarcity. This is a common occurrence during the dry season, especially in communities such as Dufuna,

Jajiburawa and Gurungu where the use of surface waters for domestic and other uses is common. Invariably, the larger a household size, the higher the waster demand and susceptibility to water scarcity. This findings is consistent with previous studies (Totoum, 2013; Victor et al., 2019), but contradicts the report of Abubakar (2019), in which case, household size was observed not to have a significant influence on domestic water consumption.

Educational Status of Household Heads and Water Consumption

Examination of the relationship between educational attainment of the household heads and the water availability per person showed a perfect positive relationship. This was observed to be significant at 95% level of confidence (n = 277, α = 0.05, p-value = .028, r = .132* in table 3). It suggests that an increase in household head educational level statistically accounts for a corresponding increase of 13.2 litres of daily water availability (44% of the per capita water sufficiency) per head. This may be attributed to the awareness on the importance of adequate water supply, especially from improved sources. On the other hand, the educational level of the household head and water demand are positively related. However, this relationship is weak (n = 276, α = 0.05, p-value = .183, r = .080 in table 3). It means the correlation between these variables, which suggests an increase of 8 litres of water with increase household member by 1, rather occurs as a chance event since their relationship is very weak. However, the correlation coefficient between the per capita vulnerability to water scarcity and household heads' education shows a perfect positive and statistically significant correlation at 95% confidence level (n = 276, α = 0.05, p-value = .014, r = .147* in table 3). By implication, it suggests that an increase in the educational level of the household heads can lead to increased vulnerability of household to water scarcity by about half of the expected water sufficiency per person. It could be argued further that the educational achievement of the household heads is positively influencing not only water availability and per capita vulnerability to water scarcity but it may also affect water sourcing behaviour of household and water usage. These findings are consistent with some studies (Adams et al., 2015; Koskei et al., 2013), that have observed significant association between household heads' education and sources of water used by households.

Table 3. Linear Correlations Matrix of Water Scarcity Drivers

		Water Availability	Water Demand	Water Scarcity Vulnerability
Household Size	Pearson Correlation	-.066	.157**	-.644**
	Sig. (2-tailed)	.271	.009	.000
	N	310	310	310
Household Head Education	Pearson Correlation	.132*	.080	.147*
	Sig. (2-tailed)	.028	.183	.014
	N	310	310	310
Household Monthly Income	Pearson Correlation	.034	.131*	.081
	Sig. (2-tailed)	.574	.029	.179
	N	310	310	310
Household Toilet Type	Pearson Correlation	-.001	-.014	.006
	Sig. (2-tailed)	.992	.814	.923
	N	310	310	310

**. Correlation is significant at the 0.01 level (2-tailed).

*.Correlation is significant at the 0.05 level (2-tailed).

Households' Income and Water Demand (Consumption)

Similarly, correlation analyses of income level of the households and per capita water availability, water demand and vulnerability to water scarcity revealed that the households' income and water availability are positively related, but the relationship is statistically insignificant (n = 277, α = 0.05, p-value = .574, r = .034). It means that only 3.4 % increase in water availability by 3.4 litres (11.3% of water sufficiency per head) can be explained by households' income status. However, the relationship between water demand and the level of households' income (Table 3) revealed a perfectly positive and statistically significant relationship at 95% confidence level (n = 277, α = 0.05, p-value = .029, r = .131*). With this, it can be argued from this that the per capita water demand is a function of the income status of the households in the study area. This is because the increase in income may influence household activities such as frequency of bathing and washing, among other domestic chores requiring water. In other words, the positive association between the vulnerability to water scarcity and the households' income status, (Table 3), is weak (n = 277, α = 0.05, p-value = .179, r = .081 in table 3). Only 8.1 % of household vulnerability to water scarcity can be explained by household income. However, similar studies have reported significant relationship between household income status and water demand, especially from improved water sources (Irianti et al., 2016; Victor et al., 2019).

Households' Toilet Type and Water Consumption

The linear correlation analyses of the households' toilet facilities with per capita water availability (n = 276, α = 0.05, p-value .992, r = -.001 in table 3) and water demand (n = 276, α = 0.05, p-value = .814, r = -.014 in table 3) revealed weak negative relationship between these variables. This is a striking outcome, since more than 60% of the households are still relying on unimproved sources of water and about 80% of the population still use unimproved sanitation facilities. However, the findings agreed with the observation of Abubakar (2019) that toilet facilities are insignificant determinants of domestic water consumption. Reliance on unimproved water sources, at the lower rung of the sanitation ladder, may have far-reaching implications, such as diseases and poverty. This is why studies such as Padhi et al. (2015), as cited in Abubakar (2017), linked the exposure to diseases such as diarrhoea, cholera, dysentery, typhoid and hepatitis, to such poor sanitation.

4. Conclusion

Significant proportions of the households are still relying on unimproved water sources despite the so-called commitments of Governments and development partners towards SDG 6.1 over the years, while women and children bear the responsibility of the water provision for the family thereby reducing their productive time for livelihood activities. There is the need to factored in to a comprehensive water resource planning for the area.

5. Recommendations

Thus, working towards increased budgetary allocations by Governments and development partners, to the rural water supply sector and sustained management of the water facilities would help in reducing the imbalances in the supply and livelihood challenges associated with water scarcity in the area. Additional investment to strengthen households' livelihoods and

income, and invariably household resilience to water scarcity is strongly recommended.

REFERENCES

Abubakar, I.R. (2017). Access to Sanitation Facilities Among Nigerian Households: Determinants and Sustainability of Implications. *Sustainability,1(1)*: 1 – 17.

Abubakar, I.R. (2019). Factors Influencing Households' Access to Drinking Water in Nigeria. *Utilities Policy*,58: 40 – 51.

Adams, E.A., Boateng, G.O. and Amoyaw, J.A. (2015).Socioeconomic and Demographic Predictors of Potable Water and Sanitation Access in Ghana. *Social Indication Research, 126(2)*: 673 – 687.

Babagana, M., Umar, I., Liman, Y.M.and Ali, M. (2018). Current Status and Problems of Portable Water Supply in Damagum Township of Fune Local Government Area, Yobe State, Nigeria. *International Journal of Agriculture Innovations and Research, 6(5)*: 269-276.

Bukar, Y. and Daura, M.M. (2015). Rural Women's Access and Adaptation to Water Scarcity in Semi-Arid Borno State, Nigeria. *Academic Research International, 6(3)*: 273 – 286.

Inkani, A.I. (2015). *Households' Vulnerability and Adaptation to Water Scarcity in Rural Areas of Katsina State, Nigeria.* Unpublished PhD Thesis, Submitted to Department of Geography, School of Post-Graduate Studies, University of Nairobi, Kenya.

Irianti, S., Prasetyoputra, P. and Sasimartoyo, T.P. (2016). Determinants of Household Drinking-water Source in Indonesia: An Analysis of the 2007Indonesian Family Life Survey. *Cogent Medicine*, 3: 115 - 143.

Koskei, E.C., Koskei, R.C., Koske, M.C. and Koech, H.K. (2013). Effect of Socio-economic factors on Access to Improved Water Sources and BasicSanitation in Bomet Municipality, Kenya. *Research Journal of Environmental and Earth Sciences*, 5(12):714- 719.

Lukman, S., Ismail, A., Asani, M.A., Bolorunduro, K.A., Foghi, P.U. Oke, I. A. (2016). Effects of Selected Factors on Water Supply and Access to Safe Water in Nigeria. *Ife Journal of Science, 18(3)*: 623 – 638.

National Population Commission (NPC) (2017). *Projected Population Figures of Nigeria.* Retrieved from http://population.gov.ngon the 20th of July 2018.

Ngohi, B.U. (2011). Sources and Determinants of Domestic Water Consumption in Maiduguri, Borno State,Nigeria. *Yobe Journal of Environment and Development, 3(1): 28-36.*

Olalekan, R.M., Adedoyin, O.O., Ayibatonbira, A.A., Anu, B., Emanuel, O.O. and Sanchez, N.D. (2019). "Digging Deeper" Evidence on Water Crisis and its Solutions in Nigeria for Bayelsa State: A Study of Current cenario. *International Journal of Hydrology, 3(4)*:244 – 257. DOI: 10.15406/ijh.2019.03.00187

Ogunbode, T. O. and Ifabiyi P.I. (2014). Determinants of Domestic Water Consumption in aGrowing Urban Centre in Osun State, Nigeria. *African Journal of Environmental Science and Technology*, 8(4): 247 255.

Orounye, E.D., Ngamdu, M.B. and Kura, A.M. (2012). Managing the Demand for Municipal Water Supply in the Semi-Arid Region: A Case of Damaturu Metropolis. *Yobe Journal of*

Environment and Development, 4(2): 6– 12.

United Nations (2020). *The Sustainable Development Goals Report*, New York, United State. Accessedvia unstats.un.org/sdgs/indicators on May 28th, 2020.

Victor, I., Abdulkadir, A. and Bwala, H.B. (2019). Correlation Study of Domestic Water Use and Socio-Cultural Factors in Bauchi Town, Bauchi StateNigeria. *International Journal of Engineering Research and Advanced Technology*, 5(5): 19 – 27.

World Bank (2020). Nigeria Biannual Economic Update: Water Supply, Sanitation and Hygiene(WASH). A Wake Up Call.

WHO/UNICEF(World Health organization/United Nations Children Emergency Fund) (2013).*Progress on Sanitation and Drinking-Water: Update Report*. World Health Organization and the United Nations' Children Emergency Fund, Geneva and New York.

Yobe State Water Supply Sanitation and Hygiene Policy (YSWSSP). (2010). A Final Policy Draft of the Yobe State Government of Nigeria. Ministry of Water Resources, Damaturu. p. 1 – 16.