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INFLUENCE OF DOMESTIC WATER SCARCITY ON SOCIOECONOMIC CHARACTERISTICS OF PEOPLE IN MAIDUGURI

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Abstract: *Water scarcity in the arid and semi-arid regions is always a major barrier to social and economic progression of the people, overshadowing the stance for growth and wealth creation. The geographical location of Maiduguri in the semi-arid region, water scarcity happens to be often the order of the day. Therefore, this paper examines the multidimensional influence of domestic water scarcity on socio-economic characteristics of the people in some selected neighbourhoods of Maiduguri. The study employed quantitative techniques using instruments such as structured questionnaire. The data collected was through close-ended questionnaires and the collected data were analysed via descriptive statistics (frequency table) and inferential statistics (Pearson correlation). The findings reveals that, there is a significant correlation of domestic water scarcity on the socioeconomic characteristics of the people such as reduction in income on sources of livelihoods, marital responsibilities and reduction on profit margins in sources livelihood of the peoples in Maiduguri. The paper recommended that government and NGOs should provide more water infrastructures and increase the supply of safe water in order to generate a wide range of potential benefits to individuals, households, and the communities at large*

Key words: *water scarcity, water supply, water demand, socioeconomic characteristics*

1.0 INTRODUCTION

Water scarcity is a major crisis of the 21st century globally, with approximately 71% of the world population suffering from moderate to severe water scarcity. It is projected that, by 2026, nearly 1.8 billion people will live in areas with absolute water scarcity, and two thirds of the world population could face water scarcity conditions (United Nation 2016). Where by 2030, water demand will exceed total water supply by 50% in most countries especially in low-income regions of the world (UN, 2020). At present, water resources have become a restrictive factor affecting sustainable economic and social development. It is widely accepted that domestic water supply is decreasing while demand is continuously rising. As a result, cities are experiencing levels of severe water scarcity (Schlamovitz *et al*, 2021).

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. It is imperative to assess domestic water scarcity in Maiduguri, Borno state Nigeria.

Water scarcity is a major problem in Africa, especially in the sub-Saharan regions due to poor management of water resources 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 population 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 uses of water 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 urbanisation and climate change, 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.

The challenges of water scarcity in Maiduguri Township stands critical as some residents can be seen trekking long distances to fetch water while other fetch from contaminated sources such as streams and ponds (Uriah *eta l*, 2023). Empirical evidence has equally revealed that, residents in Maiduguri spent long time on queue in search of water for daily activities. This negative impact has put the residents at risk of water scarcity. This results from issues such as changes in precipitation pattern and shrinking of ground water level which have ultimately profound negative impacts on domestic water use (Markonis *et al,* 2021).

1.2 Literature Review

1.2.1 Concept of Water Scarcity

Water scarcity closely related to water stress or water crisis. It refer to the lack of fresh water resources to meet the standard water demand (Kumpel *et al* 2016). There are two types of water scarcity: physical water scarcity and economic water scarcity. Physical water scarcity is where there is not enough water to meet all individual demands, including that needed for ecosystems to function. Arid areas for example sub-Saharan region often suffer from physical water scarcity. On the other hand, economic water scarcity is the result of a lack of investment in infrastructure or technology to draw water from rivers, aquifers, or other water sources, or insufficient human capacity to meet the demand for water. Most of the Sub-Saharan Africa faced economic water scarcity too (Kummu, 2016).

1.2.2. Falkenmark indicator

Falkenmark indicator is a simple and widely used method for calculating water scarcity. It requires number of people living within a given spatial domain and the volume of water available within that domain. The volume of water available per person is then calculated in m^3/cap/year. The indicator's reliance on population leads to the Water Crowding Index (WCI), which measures the number of people per unit of available water, e.g., persons/million m^3/year. A value of 1,700 m^3/cap/year of renewable freshwater was proposed as the threshold for water scarcity. If water availability falls below 1,000 m^3/cap/year, then the area experiences high water scarcity, and below 500 m^3/cap/year, absolute scarcity.

1.2.3. Water Poverty Index (WPI)

Water poverty index (WPI) aims to reflect both the physical availability of water and the degree to which human populations are served by that water subject. There is a strong link between 'water poverty' and 'income poverty'. People can also be 'water poor' because they are 'income poor'; although water is available, they cannot afford to pay for it (Lawrence *et al,* 2002). The WPI is identified as a possible indicator for monitoring progress at the local level as it puts access to water in a wider water-related context (Idogho and Yahaya, 2012).

1.2.4 Effect of water Scarcity on Urban Residents

1.2.4.1. Lack of access to drinking water

The biggest problem when you have water scarcity is that people cannot get fresh, clean drinking water. The human body can hardly survive so long without water, and a lack of drinking water can result in a number of other problems.

1.2.4.2. Hunger

If there is no water that can be used to help water the crops, then you are going to have people that are going hungry. Animals will also die, which will result in a lack of animal products as well. Water scarcity, in short, causes starvation to occur in masse for both people and animals that are located in the area

1.2.4.3. Lack of education

Water scarcity makes it difficult for people to get the education they need or deserve. Why? Mainly because those children are either too sick to go to school (which we will discuss below) or they are working to help get water to the home and the family.

1.2.4.4. Diseases

If you don't have clean water access, you will be more likely to get diseases from the available water. Whether drinking it or using it for bathing, there are so many ways of contracting water-borne diseases. Even worse, when contraction happens to one or a few people, the number of those infected can proliferate in no time as most waterborne diseases are highly contagious. In severe cases, these diseases may cause loss of lives and even spread across borders, leading to pandemics.

1.2.4.5. Poverty

All in all, people dealing with water scarcity are often stuck in poverty as well. These people are not able to get the resources they need to thrive and instead are barely surviving through these difficult times.

1.2.4.6. Migration

Water scarcity may also lead to migration waves. When large areas of land are no longer suitable for living or farming because of water scarcity, millions of people may lose their livelihood. To avoid that, these people may be forced to migrate to other places to survive.

1.2.4.7. Destruction of habitats

Water is crucial for all life forms on our planet. If water scarcity persists over a longer period, it may also lead to the destruction of whole habitats. Animals and plants may no longer be able to get enough water and may therefore die or have to move to other regions.

1.2.4.8. Management of Water Scarcity

A study conducted by Simukonda *etal* (2018) on water scarcity management outline the following responses to water scarcity.

1.2.4.9. Save water whenever possible

This could mean limiting water use, minimizing the use of washing machines, and taking quick showers instead of prolonged baths. Even if you are on vacation in countries where water isn't

scarce, try to save water and convince your family and friends to do it. Save it whenever and wherever possible.

1.2.4.10. Education

There are plenty of opportunities out there that people can use to learn more about the world around them. By educating those who are not dealing with water scarcity, they can be in a position to help. Those dealing with it can be educated on how to prevent the problem from worsening in the future.

1.2.4.11. Recycle water

There are plenty of technologies available that allow you to recycle rainwater and other water that you may be using in your home. Consider learning about how you can recycle water. Not only does it help to prevent scarcity, but it can also save you some money

1.2.4.12. Advanced technology related to water conservation

There have been a lot of water conservation efforts deployed around the world, but a lot still needs to be done to ensure that the rest of the world can conserve water. Putting money and effort into conservation could be life-saving.

1.2.4.13. Improve practices related to farming

Farming and irrigation are often huge culprits when it comes to water scarcity. Because of that, we need to improve practices so that we don't use as much water and to ensure that those using it are utilizing it to its fullest potential. Technology also needs to advance in this manner.

1.2.4.14. Better water distribution infrastructure

Many people worldwide, especially in poor developing countries, are still not connected to the public water infrastructure. These people often rely solely on fountains to meet their water demand, which may not work in droughts.

These people are at high risk of suffering from severe water shortages. By connecting these people to the public water supply, the water scarcity risk could be greatly reduced.

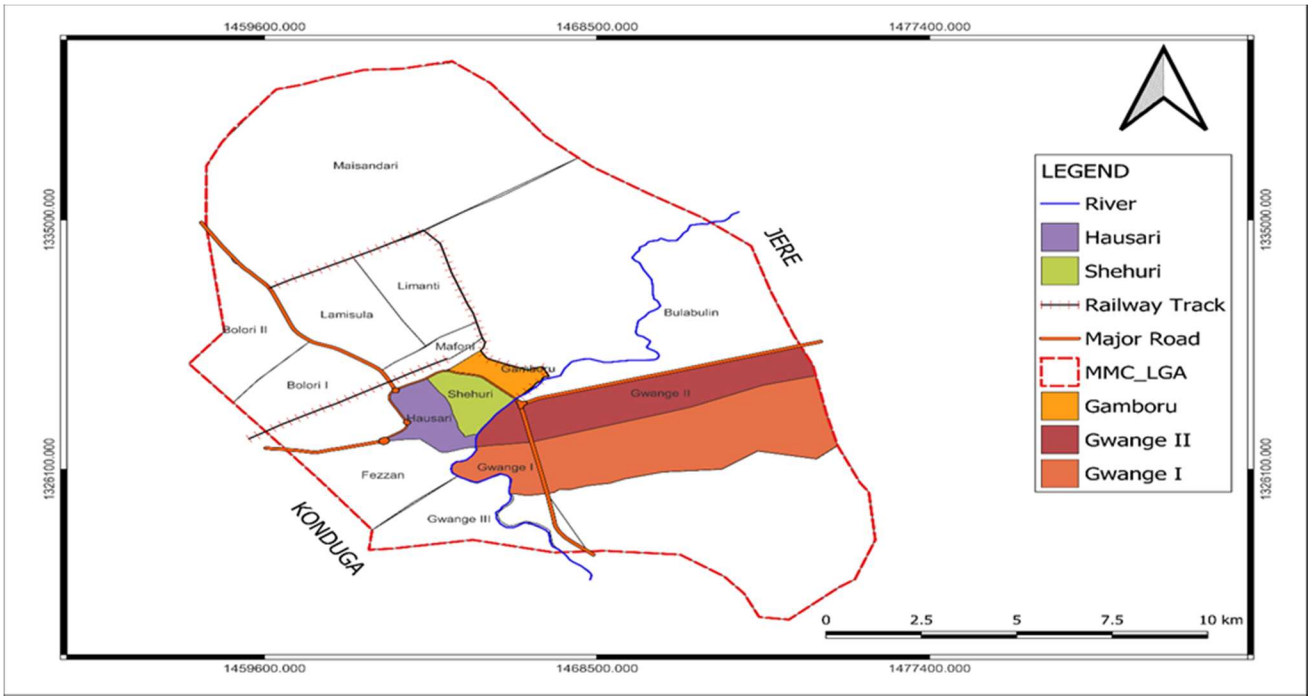
1.2.4.15. Factors affecting water demand

Factors affecting water demand are all anthropogenic by nature. Population, its growth rate and changes in consumption patterns directly affect demand for goods and services, and the water associated with their production, processing and delivery. Water use sectors are conventionally organized into agricultural, industrial (including evaporated cooling water) and municipal (including domestic). Recreational uses, hydropower generation and environmental flows are generally considered to be non-consumptive users, except when extensive open water evaporation result from in-stream storage. Population also affects water resources indirectly through changes in land use and water use patterns, with significant implications at local, regional and global levels (UN-Water, 2018).

1.3 Study area and Methodology

Maiduguri Metropolis, a major city in the Northeastern corner of Nigerian, is located between latitudes 11˚04'N and 11˚44'N; and between longitudes 13˚04'E and 13˚44'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. The city sits along the seasonal Ngadda River which disappears into the Firki swamps in the areas around Lake Chad. 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. The region was home to the Kanem-Bornu Empire for centuries, Maiduguri actually consists of the two cities: Yerwa to the west and old Maiduguri to the east. Old Maiduguri was selected by the British as their military headquarters

while Yerwa was selected at approximately the same time by Shehu Abubakar Garbai of Borno replace Kukawa as the new traditional capital of the Kanuri people (Ellawala *et al,* 2016).



Source: Author (2024)

According to Uji (2009) "objectives of research determine the research design" As such the study employed quantitative research method. Stratified random sampling techniques was used for the study to administer the structure close-ended questionnaire. A sample size of 346 were taken across the study. Then the collected data were analysed through the descriptive statistics (frequency table) and inferential statistics (Pearson correlation). And the results were presented in tables**.**

RESULTS AND DISCUSSIONS

Table 1: Existing State of water Demand and Supply in the study area

N/S	Wards	Number of Household	Average Water Supply p/c/p/d (L)	Total Water supply per ward per day Per person	Average Water Demand p/c/p/d (L)	Total water demand per ward per day per person	shortfall	Percent of water demand satisfied by supply (%)
1	Shehuri	87	16	1392	45	3915	2523	25
2	Gamboru	96	24	2304	55	5280	2976	30
3	Gwange I	73	13	949	36	2628	1679	17
4	GwangeII	83	8	664	33	2739	2075	20
5	Hausari	41	11	451	30	1230	779	8
TOTAL		**380**		**5760**		**15792**	**10032**	**100**

Source: Author 2024

Table 1 shows the total water demand and supply in the study area. The results of the table revealed that, total water supply of the target households is 5760, while the demand stand at 15792 creating deficit of 10031 litres per day in the study area.

Table 2: Correlation between income and water usage in the study area

		Correlation Coefficient	
income	Pearson Correlation	1	0.795**
	Sig. (2-tailed)		.002
	N	380	380
Water Usage	Pearson Correlation	0.795**	1
	Sig. (2-tailed)	.002	
	N	380	380

Source: Field Work 2024

Table 2 above indicate relationship between income and water usage in the study area. The table reveals that the income level of respondents was positively correlated with water consumption. As the value of P< 0.05 and r is 0.795 this implies that there is a significant relationship between the variables. On average, the study found that 61% of the total water supply in the study area is used by those who earning above 100,000, 22% use by those earning 30,000-100,000 while 17% use by those earning below 30,000. High water consumption may be due to the high living standard of the of individual. Because higher level of income is associated with high living standards.

Source: Field Work 2024

Table 3 indicate relationships between age and water consumption in the study area. The results of the table reveals that the alpha value is less than 0.05 and correlation coefficient is 0.795. This implies that the relationship between the two variables is significant and positive. The research found that, people aged 1 – 4 uses 31% total water supply, those 15 – 49 use 57% while those above 50 use 12%. According the Sugirtharan (2020) The water usage behaviours can be quite different among different ages of household members. Elder people use less water than younger people. However, Schleich and Hillenbrand (2019) found the opposite, that the elder

Table 3: Correlation between Age and water usage in the study area

			Correlation Coefficient
Age	Pearson Correlation	**1**	0.775**
	Sig. (2-tailed)		.002
	N	380	380
Water Usage for age	Pearson Correlation	0.775**	1
	Sig. (2-tailed)	.002	
	N	380	380

people use more water because retired people spend more time at home and garden

Table 4: Correlation between Household Size and water usage in the study area

			Correlation Coefficient
Household Size	Pearson Correlation	**Correlation Coefficient**	0.611**
	Sig. (2-tailed)		.003
	N	380	380
Water Usage	Pearson Correlation	0.611**	1
	Sig. (2-tailed)	.003	
	N	380	380

Source: Field Work 2024

Table 4 indicate correlation between household size and water usage in the study area. The table reveals that the household size of the respondents influences water consumption. As the table reveals that the alpha is less than 0.05 and r is 0.611 this implies that there is a significant

relationship between the variables. On average, the study found that, the household with more people use water than household with less people.

Table 5: Correlation between Marital Status and water usage in the study area

			Correlation Coefficient
Marital Status	Pearson Correlation	1	0.823
	Sig. (2-tailed)		.001
	N	380	380
Water Status	Pearson Correlation	0.823	1
	Sig. (2-tailed)	.001	
	N	380	380

Source: Field Work 2024

Table 5 indicate relationships between marital status and water consumption in the study area. The results of the table reveal that P< 0.05 and the correlation coefficient is 0.823. This implies that the relationship between the two variables is significant and positive. The research found that, 69% of the total water supply is used by married couple while 31% is use by non-married

Table 6: Correlation between Gender and water usage in the study area

			Correlation Coefficient
Gender	Pearson Correlation	1	0.840**
	Sig. (2-tailed)		.001
	N	380	380
Water Usage	Pearson Correlation	0.840**	1
	Sig. (2-tailed)	.001	
	N	380	380

Source: Field Work 2024

Table 6 indicate correlation between gender and water usage in the study area. The table reveals that, the gender of the respondents was positively correlated with water consumption. As the value of P< 0.05 and r is 0.840 this implies that there is a significant relationship between the variables. On average, the study found that, 60% of the total water supply is used by female while 40% is use by male

Table 7: Correlation between Education Level and water usage in the study area

			Correlation Coefficient
Education Level	Pearson Correlation	1	-0.659**
	Sig. (2-tailed)		.003
	N	380	380
Water Usage	Pearson Correlation	-.659**	1
	Sig. (2-tailed)	.003	
	N	380	380

Source: Field Work 2024

The education level also influences the water consumption of the respondents. It is shown that the total domestic water consumption is negatively correlated with education level as $p<0.05$ and the correlation coefficient is -0.659. This finding supported by Collins et al, (2017) But in contras, Keshavarzi et al, (2018) reported that the low level of education of elders regarding environmental matters leads them to consume more water than do younger people.

1.5 Conclusion/ Recommendation

The water scarcity in Maiduguri revealed to have several influence on the people socio-economic characteristics in the study areas. One of the aspects of their lives affected by the scarcity of water it reduces income and time in sources of livelihood activities. The perceived effect of the water scarcity reduces time for the marital responsibilities of the people having significant correlation coefficient. Water scarcity affect profits margins and the consequences of it could eventually put immense pressure on available limited water for domestic use. The scarcity of the water supply restrict respondents from carrying out some livelihood activities. Therefore, it recommended that government and NGOs should provide more water infrastructures and increase the supply of safe water in order to generate a wide range of potential benefits to individuals, households, and the communities at large.

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