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Household Water Access and Coping Strategies in Nasarawa-Tsangaya Damaturu, Yobe State, Nigeria

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Abstract

Water is central to human survival, public health, and socio-economic development, yet many peri-urban communities in northern Nigeria face persistent challenges of inadequate access, poor service reliability, and overdependence on self-provision. This study assessed household water sources, patterns of use, scarcity experiences, and coping strategies in Nasarawa-Tsangaya, a peri-urban settlement in Damaturu, Yobe State, Nigeria. A descriptive survey design was employed, and data from 100 validly completed questionnaires were analyzed using simple percentages. Results showed that boreholes and wells were the dominant household water sources (95%), while piped water accounted for only 5%. Water was primarily used for drinking and cooking, although most households also purchased water from vendors and stored it in plastic containers to manage shortages. Mechanical failure of boreholes was identified as the leading cause of scarcity, alongside seasonal variations and infrastructural limitations. The study concludes that household water supply in Nasarawa-Tsangaya is heavily reliant on groundwater and vulnerable to mechanical and institutional failures. It recommends enhanced operation and maintenance of boreholes, women's participation in water governance, and increased adoption of household-level conservation practices.

Keywords: Coping Strategies, Domestic Water Use, Scarcity, Water Access, Water Governance.

Introduction

Water is a finite yet renewable natural resource that underpins human health, food security, and sustainable livelihoods. Its role in sanitation, hygiene, and agriculture makes it indispensable for the achievement of Sustainable Development Goal (SDG) 6, which targets universal access to clean water and sanitation (UN-Water/Africa, 2004). However, global statistics reveal that nearly two billion people still lack access to safe drinking water, with sub-Saharan Africa accounting for a substantial share of this deficit (WHO & UNICEF, 2025).

Where water is adequately managed, it drives economic growth, social welfare, and environmental resilience. Conversely, poor water management and scarcity contribute to disease outbreaks, reduced agricultural productivity, and deepening poverty (Ingrao *et al.,* 2023). Inadequate access to water also reinforces gender inequality, as women and children often bear the burden of water collection, limiting their participation in education and income-generating activities (Graham *et al.,* 2016).

In Nigeria, the water supply sector has undergone cycles of progress and decline. Colonial administrations established urban waterworks for public health purposes (World Bank Group, 2021). However, post-independence policies and funding constraints led to the deterioration of infrastructure, particularly in rural and peri-urban areas (Ugwu *et al.,* 2021). Programs such as the River Basin Development Authorities (RBDAs) and the Directorate of Food, Roads and Rural Infrastructure (DFRRI) attempted to extend rural water access through borehole construction, yet most facilities failed due to weak governance, corruption, and poor maintenance (Abah & Naankiel*,* 2019).

Yobe State, located in the semi-arid northeast, typifies this challenge. Damaturu, the state capital, experiences short rainy seasons and long dry spells, making groundwater abstraction essential. Nasarawa-Tsangaya, a fast-growing peri-urban community, depends largely on community and private boreholes, wells, and vendors. Interruptions in any of these sources, particularly mechanical breakdowns, lead to significant shortages.

This study aims to assess domestic water use and scarcity in Nasarawa-Tsangaya by addressing four key objectives:

1. To identify the main household water sources.
2. To examine water-use patterns and quantities.
3. To analyze the frequency and perceived causes of scarcity.
4. To document coping and conservation strategies adopted by households.

Findings from this study are expected to inform local-level implementation of Nigeria's National Water Resources Policy (2000) (Federal Ministry of Water Resources, 2000) and support Yobe State's efforts to improve equitable and sustainable access to water.

Water Access and Development

Access to adequate and safe water is a cornerstone of sustainable development. Numerous studies have demonstrated that inadequate access correlates with higher

prevalence, reduced productivity, and lower quality of life (UN-Water/Africa, 2004). The World Health Organization (2023) notes that water-borne diseases, such as cholera and dysentery, remain major causes of mortality in developing countries. Reliable access to clean water reduces these risks, enhances hygiene, and contributes to economic stability by freeing time for education and productive activities.

Evolution of Water Supply in Nigeria

Nigeria's history of water supply illustrates the crucial role of institutional capacity and sustained investment. While post-colonial efforts led to the deterioration of existing infrastructure, particularly in rural and peri-urban areas, subsequent programs like the River Basin Development Authorities (RBDAs) and the Directorate of Food, Roads and Rural Infrastructure (DFRRI) attempted to bridge the access gap through projects such as borehole construction (Abah & Naankiel, 2019; World Bank Group, 2021).

Despite these efforts, systemic issues have persisted. A combination of weak governance, insufficient funding, poor maintenance regimes, and a deficient regulatory environment continues to undermine the success and sustainability of water facilities across the country (World Bank Group, 2021). The pattern of progress and decline persists, demonstrating that many of the challenges identified in older analyses remain highly relevant today.

According to the Federal Government of Nigeria/MDGs Report (2005), only about 60% of the national population had access to safe drinking water by 2005, with rural access below 50%. This persistent shortfall emphasizes the gap between policy ambitions and local implementation realities.

Household Water Use Patterns

Domestic water uses patterns vary by geography, income, and infrastructure. Matos *et al*. (2013) found that indoor activities such as kitchen use, bathing, and toilet flushing dominate household consumption. In Nigeria, where piped networks are limited, households depend on wells, boreholes, and water vendors. Global Water Partnership (2000) note that informal water markets and private wells are essential stopgaps in peri-urban areas, although they often compromise affordability and safety.

Water Scarcity, Climate Change, and Adaptation

Water scarcity manifests physically, when resources are insufficient, or economically, when institutions fail to deliver existing water efficiently (Twisa, & Buchroithner, 2019). Climate change exacerbates both types by altering rainfall patterns, increasing evaporation, and lowering groundwater recharge. In semi-arid northern Nigeria, rainfall variability has reduced agricultural output and intensified domestic water insecurity (Global Water Partnership, 2000; Da'u *et al.,* 2017). Adaptation thus requires improved water governance, community participation, and technological innovations for conservation.

Materials and Methods

Study Area

Nasarawa-Tsangaya is a peri-urban settlement within Damaturu metropolis, the capital of Yobe State, Nigeria, situated between latitudes 11°39′30″–11°47′00″ N and longitudes 11°54′00″–12°02′00″ E (Figure 1). Covering an area of 2,366 km² with a population of 88,014 (NPC, 2006), the settlement lies in the Sudan–Sahel ecological zone. This region is characterized by a short rainy season (June–September) and a long dry season (October–May), with an average annual rainfall of approximately 500 mm and high evapotranspiration. Consequently, groundwater abstraction through boreholes and wells constitutes the primary domestic water source.

Damaturu and its environs experience a semi-arid savannah climate with mean maximum temperatures ranging from 38–42 °C, prolonged dry periods, and high susceptibility to desertification. These climatic conditions result in sandy terrain during the dry season and muddy surfaces during the rainy season (Gana & Sa'id, 2022). The metropolis is bordered by Tarmuwa Local Government Area (LGA) to the north, Gujba LGA to the south, Fune LGA to the west, and Kaga LGA (Borno State) to the east.

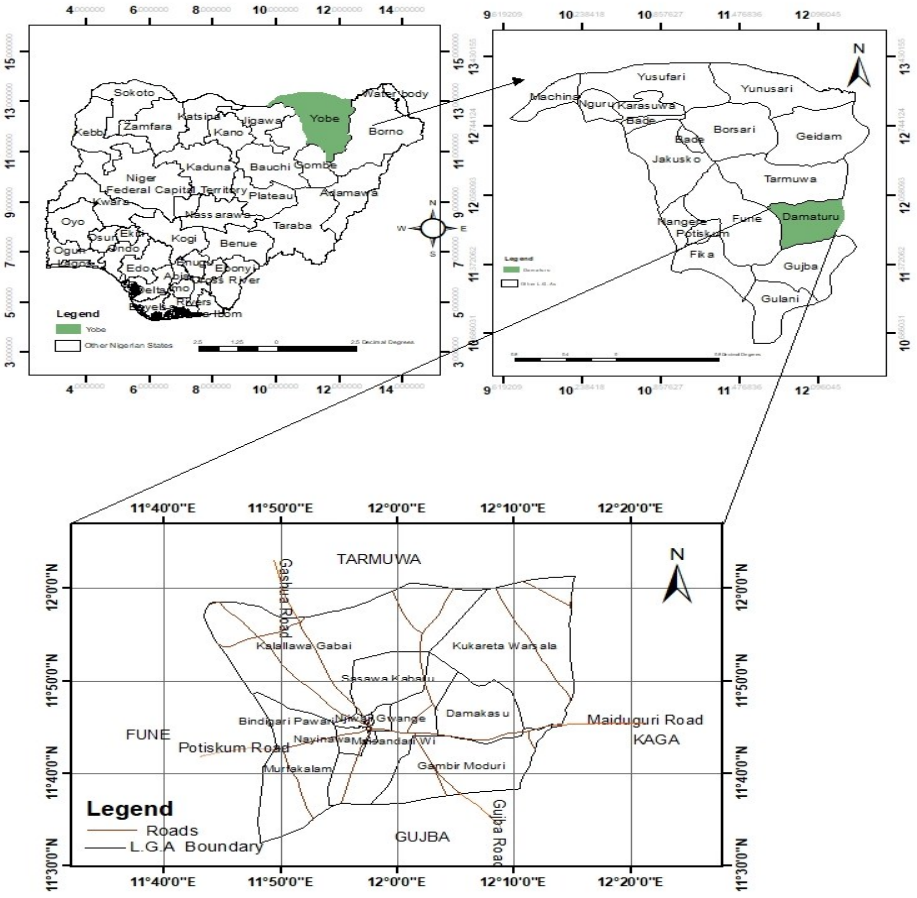


Figure 1. Map of Yobe State Showing Damaturu town .

Research Design

This study adopted a descriptive survey design, suitable for systematically describing the characteristics of a defined population (Nworgu, 2006). The design allows the use of structured instruments to gather quantitative information on household water use, scarcity experiences, and coping mechanisms.

Population, Sampling and Data Collection

Households were selected using a convenience sampling approach based on accessibility and willingness to participate, as a comprehensive household sampling frame was not available for Nasarawa-Tsangaya. A total of 150 questionnaires were administered, of which 100 were validly completed and analyzed. The questionnaire was pre-tested on 10 households in a nearby community to verify clarity, relevance, and reliability, and the feedback was used to refine ambiguous items before final administration. Data were then collected using the validated structured questionnaire, supported by brief interviews and field observations, to obtain information on respondents' socio-demographic characteristics, household water sources and volumes, frequency and causes of water scarcity, and coping strategies.

Sampling and Instrument Validation

Households were selected using a convenience sampling approach based on accessibility and willingness to participate during the survey period, as a comprehensive household sampling frame was not available for Nasarawa-Tsangaya. This approach is commonly adopted in peri-urban field surveys where settlements are rapidly expanding and household registers are incomplete. The questionnaire was pre-tested on 10 households in a nearby community to verify its clarity, relevance, and reliability, and the feedback obtained was used to refine ambiguous items before final administration. Data were then collected using the validated structured questionnaire, supported by brief interviews and field observations, to obtain information on respondents' socio-demographic characteristics, household water sources and volumes, frequency and causes of water scarcity, and coping strategies.

Data Analysis

The collected data were analyzed using descriptive statistics, specifically simple percentages, and presented in frequency tables to enhance clarity. This approach was selected for its effectiveness in summarizing responses and identifying dominant trends within the community. All analyses were performed using Microsoft Excel (version 2024).

Results and Discussion

Results

1. **Socio-Demographic Characteristics of Respondents**

This section presents the socio-demographic characteristics of respondents, the sources and uses of household water, frequency and causes of scarcity, and the coping mechanisms adopted by residents of Nasarawa-Tsangaya, Damaturu.

Table 1: Distribution of Respondents by Sex

Sex	Frequency	Percentage (%)
Male	60	60
Female	40	40
Total	**100**	**100**

The sample comprised slightly more males (60%) than females (40%), reflecting cultural patterns in which men typically respond to surveys even though women bear the major responsibility for household water collection. The male dominance in the sample aligns with regional social norms that limit women's direct participation in formal research, though women play a crucial role in household water management

Table 2: Educational Status of Respondents

Educational Level	Frequency	Percentage (%)
Primary	4	4
Secondary	47	47
Tertiary	39	39
Informal (Qur'anic)	10	10
Total	**100**	**100**

Most respondents (86%) had attained at least secondary education. This relatively high literacy rate for a peri-urban community suggests a potential for effective participation in community-based water management, user education programs, and environmental awareness initiatives.

Table 3: Occupational Status of Respondents

Occupation	Frequency	Percentage (%)
Student	50	50
Civil Servant	30	30
Self-Employed	4	4
Others	16	16
Total	**100**	**100**

Students (50%) and civil servants (30%) constituted the majority of respondents, indicating that the community has a relatively young, economically active population. This implies a strong demand for regular and reliable water supply to support both domestic and institutional needs (e.g., schools, workplaces).

Table 4: Household Size of Respondents

Number of Persons	Frequency	Percentage (%)
5–10 persons	10	10
10–15 persons	60	60

Number of Persons	Frequency	Percentage (%)
15–20 persons	30	30
Total	**100**	**100**

Large households are typical of Nasarawa-Tsangaya, with 90% of respondents reporting ten or more members per household. Such high household densities intensify daily water demand and magnify the effects of scarcity, particularly during dry seasons or borehole breakdowns.

2. Household Water Sources and Usage

Table 5: Main Household Water Sources

Source	Frequency	Percentage (%)
Borehole/Well	95	95
Tap/Piped Water	5	5
Rainwater (Primary Source)	0	0
Total	**100**	**100**

Boreholes and wells accounted for 95% of domestic water sources, confirming the community's overwhelming reliance on groundwater. Piped water from municipal sources was almost non-existent, indicating the absence of formal water infrastructure. This dependency increases vulnerability to borehole mechanical failures and water quality degradation.

Table 6: Main Uses of Water in Households

Use	Frequency	Percentage (%)
Drinking/Consumption	61	56.5
Cooking/Washing Utensils	19	17.6
Bathing	16	14.8
Other Domestic Uses	12	11.1
Total	108*	100

Note: *Multiple responses were recorded because households use water for more than one purpose.*

Water use was dominated by drinking and food-related activities (56.5%), followed by hygiene uses. These patterns highlight the importance of ensuring both availability and quality of groundwater sources, as contamination could have serious public health consequences.

3. Frequency and Causes of Water Scarcity

A majority (72%) of respondents reported running out of water at least once a month, 14% twice a week, and a smaller fraction almost daily. The leading causes of scarcity were mechanical failure of boreholes (65%), difficulty accessing functional boreholes (16%), and seasonal shortages (14%). Only 5% cited other causes such as vandalism or poor management.

Table 7: Frequency and Causes of Water Scarcity

Cause of Scarcity	Frequency	Percentage (%)
Borehole Breakdown	65	65
Long Queues/Access Difficulty	16	16
Seasonal Groundwater Fluctuation	14	14
Other Causes	5	5
Total	**100**	**100**

The prevalence of mechanical failure underscores inadequate maintenance regimes and the absence of rapid-response repair mechanisms. This finding reinforces the need for community-based maintenance teams and the training of local technicians to sustain borehole functionality.

4. Coping and Conservation Strategies

Households adopted diverse coping strategies to mitigate the effects of water scarcity. The most common were purchasing water from vendors (95%), rainwater harvesting (75%), and water storage in plastic containers (50%). Less common practices included using clay pots or reusing grey water.

Table 8: Coping Strategies Adopted by Households

Coping Strategy	Frequency	Percentage (%)
Purchase from Vendors	95	95
Rainwater Harvesting	75	75
Storage in Plastic Containers	50	50
Use of Jerrycans/Clay Pots	20	20
Reuse of Grey Water	10	10
Total	250*	100

Note: *Multiple responses were allowed because households use several strategies simultaneously.*

Water purchase from vendors is a widespread adaptation mechanism, although it increases household expenditures and disproportionately affects low-income families. Rainwater harvesting and plastic storage are positive, low-cost coping strategies that could be expanded through awareness campaigns and simple household technologies.

Discussion

The findings of this study reveal a persistent reliance on boreholes and wells (95%) as the dominant household water sources in Nasarawa-Tsangaya, while piped water systems remain virtually absent. This pattern is consistent with reports from other peri-urban settlements across northern Nigeria, where groundwater dependence dominates due to insufficient public water infrastructure (Imam *et al.,* 2023). Similarly, Alao *et al*. (2024) found that in parts of

Kaduna and Kano States, over 80% of households depend on self-supplied boreholes, exposing communities to risks associated with mechanical breakdowns and potential contamination.

Socio-Demographic Characteristics

Out of 100 respondents, 60% were male and 40% female. Although women bear the greater burden of water collection, cultural norms in northern Nigeria often result in men responding to surveys. Educational attainment was relatively high: 47% had secondary education and 39% tertiary education. This literacy level suggests potential for participatory water management. Occupationally, 50% were students, 30% civil servants, 4% self-employed, and 16% engaged in other activities. Household size was notably large: 90% of respondents reported between 10 and 20 persons per household. Large household sizes increase daily water requirements and heighten vulnerability to supply disruptions.

The socio-demographic profile, characterized by large household sizes (10–20 persons) and relatively high literacy levels, suggests a strong potential for participatory water governance if adequate institutional frameworks exist. Comparable studies in Gombe and Maiduguri have shown that education significantly enhances awareness of water conservation and willingness to contribute to maintenance costs (Baba-Adamu, & Jajere, 2021). However, large household sizes intensify domestic water demand, aggravating shortages during dry seasons a challenge similarly documented by (Purba, & Wahyu, 2022) in semi-arid Nigerian towns.

Household Water Sources and Usage

As shown in Table 5 of the original dataset, boreholes and wells accounted for 95% of water sources, while only 5% relied on piped water. This reflects the dominance of self-provision and community-operated boreholes. Drinking and cooking represented the largest uses (56.5%), followed by washing (17.6%) and bathing (14.8%). These findings corroborate similar studies in semi-arid Nigeria that emphasize groundwater dependence (NEST, 1991; IDRC, 2010).

The near-absence of municipal water infrastructure underscores the need for decentralized water systems, improved maintenance, and household-level hygiene interventions.

Frequency and Causes of Water Scarcity

Approximately 72% of respondents experienced water scarcity once a month, while 14% reported twice-weekly shortages. Mechanical breakdowns of boreholes accounted for 65% of scarcity causes, followed by poor accessibility and reduced groundwater levels during the dry season. The prevalence of mechanical failure highlights weak technical capacity and delayed repairs.

Water Sources and Use Patterns

The predominance of boreholes and wells corroborates the findings of Alao *et al*. (2024), who noted that over 90% of households in peri-urban Yobe rely on groundwater for drinking and cooking. However, unlike urban centres with intermittent piped water, peri-urban areas remain outside municipal distribution networks, perpetuating inequalities in access. The prioritization of water for drinking (56.5%) and food preparation aligns with WHO (2023) recommendations that emphasize potable water for essential domestic needs. Yet, the near-total absence of piped systems indicates institutional neglect and underscores the inadequacy of state-level water investment (Ugwu *et al*., 2021).

Water Scarcity and Institutional Failures

Frequent water scarcity, reported by 72% of respondents, was largely attributed to borehole mechanical failure (65%). This finding echoes the results of Gana & Sa'id (2025), who identified equipment failure and delayed repairs as major causes of rural water supply interruptions in northeastern Nigeria. The absence of preventive maintenance and lack of trained technicians remain systemic constraints. Additionally, seasonal declines in groundwater levels during the dry months parallel trends observed in other Sahelian communities (Da'u *et al*., 2017). Climate variability and declining aquifer recharge exacerbate the problem, particularly where rainfall patterns have become increasingly erratic (Ingrao *et al*., 2023).

Coping Strategies

Household coping mechanisms in Nasarawa-Tsangaya include reliance on water vendors (95%), rainwater harvesting (75%), and water storage in plastic containers (50%), with smaller proportions using clay pots and jerrycans. These responses demonstrate behavioral flexibility and financial adaptation to water scarcity. However, heavy dependence on vendors heightens expenditure and deepens inequality, as low-income households spend a greater share of income on water (World Bank, 2021). Similar patterns were reported by Nnaji *et al*. (2013) and Tobin *et al*. (2013), who identified water vending as an informal resilience mechanism that simultaneously imposes financial strain on poorer families.

The widespread practice of rainwater harvesting reflects local innovation consistent with Purba and Wahyu (2022), who observed that well-managed rainwater systems can mitigate dry-season shortages. Overall, household water security in Nasarawa-Tsangaya is influenced by technical, institutional, and socio-economic factors. Borehole breakdowns highlight the limits of community-based maintenance, while large household sizes exacerbate scarcity impacts. Frequent recourse to vendors supports IDRC's (2010) observation that informal water markets serve both as adaptive responses and as indicators of weak water governance.

These findings suggest that preventive maintenance, training of local artisans, and women's participation in water-point management could enhance system reliability. Moreover, the

community's demonstrated willingness to harvest rainwater underscores readiness for adopting low-cost water conservation strategies.

Comparative Perspective and Policy Implications

Overall, the study's findings align with national patterns of water insecurity in Nigeria's semi-arid regions, where inadequate infrastructure, weak governance, and socio-economic pressures converge to limit sustainable access (Ugwu *et al*., 2021; Federal Ministry of Water Resources, 2000). Compared with recent initiatives in southern states where small-scale piped networks have improved reliability (Gbahabo, 2015), Yobe's peri-urban communities remain underserved. Integrating community-based management, particularly through women's participation in decision-making, has proven effective in improving maintenance outcomes (Graham *et al*., 2016; Rahman *et al.,* 2017). Therefore, empowering local users and institutionalizing preventive maintenance systems are vital for sustaining groundwater-based supply schemes.

Conclusion

This study examined household water use and coping strategies in Nasarawa-Tsangaya, Damaturu, revealing heavy reliance on boreholes, vulnerability to breakdowns, and growing dependence on private water vendors. Large household sizes and limited institutional support exacerbate scarcity. Despite these challenges, the community demonstrates adaptive capacity through rainwater harvesting and storage practices.

Recommendations:

1. **Preventive maintenance:** Local authorities should institute a preventive maintenance program and rapid-response mechanism for community boreholes.
2. **Inclusive management:** Women, who bear primary responsibility for water collection, should be represented in water committees and decision-making processes.
3. **Conservation education:** Environmental health programs should promote household water conservation and hygienic handling practices.
4. **Infrastructure expansion:** Small-scale piped schemes and additional boreholes should be constructed to reduce dependence on vendors.
5. **Economic evaluation:** Future studies should quantify the cost of water scarcity on household income and health to guide targeted subsidies and investments.

Authors' Contributions

Abdullahi Hassan Gana: Conceptualization, Methodology, Literature review, Data curation, Writing: Original Draft.

Abba Idris Sa'id: Validation, Writing: Review & Editing, Critical revision for intellectual content.

Conflicts of Interest

The authors declare no conflicts of interest.

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