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Spatial Inequality of Domestic Water Access in Ibadan North Local Government Area, Oyo State, Nigeria

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Abstract

This research centered on identifying the socioeconomic factors that contribute to the disparities in water access, the source of domestic water supply, proximity to the nearest water supply, and water accessibility in the study area. This has necessitated the study to examine the spatial inequality of domestic water access in the area. So therefore, 10 areas were selected in Ibadan North LGA and 40 questionnaire was distributed across each selected area.

Based on the survey, 34.5% of the participants obtained their water supply from hand-dug wells, 33.5% from boreholes, 30.5% from pipe-borne water, and 1.5% from stream ponds. Furthermore, it was found that 61% of respondents said their home was very close to the nearest water source (1–15 minutes), 26.5% said their home was close (16–30 minutes), and 12.5% said their home was very far (31–45 minutes) from the nearest water supply source. Additionally, 56.4% of respondents said they were satisfied with the current state of water distribution in their neighborhood. In spite of this, the majority of respondents state that they are dissatisfied with the current state of water distribution in their community due to various issues.

Keywords: *Water supply, Accessibility, Proximity, Socio Economic Activities.*

1. Background of Study

Water is unarguably an essential commodity after air with an unparalleled value and there is virtually nowhere water is not important, be it in the biosphere as humans barely survived a few days without water because a constant supply of water is needed to replenish the fluids lost through normal physiological activities, such as respiration, perspiration, urination, (Shalom et al., 2011), atmosphere because the role of water in our environment is highly complex (Navalpotro et al., 2013), and lithosphere (Aderogba et al., 2012; Mayers, 2005). Improvements in drinking water and sanitation convey significant economic returns through improved health; these returns outweigh the cost of supplying water and sanitation services (Hutton, 2013).

Water and sanitation remain a pressing public health issue, with broad implications for health and development in Nigeria. Having access to improved drinking water and sanitation is directly related to the prevention of disease and death from diarrhea disease, trachoma, and intestinal helminths (Ascaris, Trichuris, hookworm); it also helps to mitigate risks associated with malnutrition (i.e. resulting from the inability to derive nutritional value from food) and the underlying determinants of malnutrition. (Fewtrell, et al, 2005; Bartram, 2005; Esrey,1991; Humphrey, 2009). The Joint Monitoring Program (JMP) in its 2020 WASH report at the household level estimates global access to safely managed water to be 74%, an increase of 4% compared with the baseline figure of 70% in 2015 (WHO and UNICEF, 2021). The report revealed significant disparities in safely managed water coverage by SDG regions – 96% in Europe and Northern America, 79% in Northern Africa and Western Asia, 75% in Latin America and the Caribbean, 62% in Southern and Central Asia, and 30% in sub–Saharan Africa (WHO and UNICEF,2021). According to the Joint Monitoring Programs (JMP), the world is currently off track in achieving SDG target 6.1 unless the current rate of progress is quadrupled. In most sub-Saharan African countries, achieving universal access to safely managed water service by 2030 will require an increase in current rates of progress by about 10-20 times.

According to (WHO, 2004), water access revolves around distance and time indices. These indicators show four paramount levels of accessibility; No access, for the worst scenario; Basic access; Intermediate access, and Optimal access all based on time and distance. Adeyemo et al,2006), defined accessibility as the balance between the demand for and the supply of consumer services over geographic space, and narrowing or bridging the gap between geographic spaces is all about the significance of transport. In Nigeria, water availability controls population distribution as settlements that are provided with modern water supply networks are usually those situated along the major trade and transportation networks, and all improved water supply in Nigeria is from public water supplies (Oyebande, 2005).

Access to safe drinking water and sanitation are human rights, conferring benefits to human well-being beyond their impact on health. The global health and development community has prioritized access by including safe water and sanitation targets in both the Millennium Development Goals and more recently in the Sustainable Development Goals (SDGs), in which the UN called for access to be universal (i.e., 100% access) and equitable. Despite substantial expansion of access during the Millennium Development Goals era, it has been previously estimated that less than 75% of the population in many countries in sub-Saharan Africa and South and Southeast Asia had access to improved facilities in 2017 (United Nations, 2012). Poor access to water remains one of the most pressing challenges across the world, especially in Sub-Saharan Africa (SSA), a region that is home to nearly 48% of the current global population without access (WHO and UNICEF, 2015).

The global community adopted the eight Millennium Development Goals (MDGs) in 2000 as part of efforts to reduce poverty and address major inequalities in development, including in water access. Millennium Development Goal (MDG) seven sought to decrease by half the number of people in the world without access to an improved water source by the year 2015; this goal was

achieved in 2010, five years ahead of schedule (UN, 2012). Also in 2010, the UN officially recognized access to water as a human right, specifying that every human is entitled to sufficient, safe, acceptable, physically accessible, and affordable water (UN General Assembly, 2010).

Since 1990, the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation, and Hygiene has reported on access to safe drinking water worldwide. WHO/UNICEF defines drinking water as safely managed if it comes from an improved source that is accessible on premises, available when needed, and free of fecal and priority chemical contamination.

The inadequacies observed in the Nigerian water supply sector led to the formulation of a National Water Supply Policy (NWSP). The policy is aimed at ensuring the provision of sufficient potable water to all Nigerians affordably and sustainably through participatory investment by the three tiers of the government, the private sector, and the beneficiary. One of the key targets of the policy is to extend service coverage to 100% of the population in the year 2011 and to sustain 100% full coverage of water supply for the growing population beyond the year 2011 (Gbadegesin, Olorunfemi, 2009; FGN, 2011). It has been estimated that overall, 9% of the global burden of disease could be prevented through improvement in adequate WASH (Hutton, 2013; Bartram, et al.,2005).

Spatial inequality in water access is tied to underlying issues related to urban planning and infrastructure development. By analyzing the distribution of domestic water resources, researchers can identify areas that lack adequate infrastructure and highlight the need for improvements in water supply networks. This information is valuable for urban planners and policymakers in making informed decisions about infrastructure investments and equitable development.

Access to safe and clean water is a fundamental human right as recognized by the United Nations. The study of spatial inequality in domestic water access contributes to achieving SDG 6, which focuses on ensuring availability and sustainable management of water and sanitation for all. Understanding where disparities in water access exist helps authorities prioritize interventions and investments to bridge these gaps and make progress towards achieving SDG targets.

2. Significance of Study

By studying spatial inequality of domestic water access in Ibadan North LGA Nigeria, researchers can identify disparities and advocate for more equitable distribution to ensure all residents have equal access to safe and reliable water resources. This contributes to social justice and promotes inclusive development.

Spatial inequality in water access is tied to underlying issues related to urban planning and infrastructure development. By analyzing the distribution of domestic water resources, researchers can identify areas that lack adequate infrastructure and highlight the need for improvements in water supply networks. This information is valuable for urban planners and policymakers in making informed decisions about infrastructure investments and equitable development.

Access to safe and clean water is a fundamental human right as recognized by the United Nations. The study of spatial inequality in domestic water access contributes to achieving SDG 6, which focuses on ensuring availability and sustainable management of water and sanitation for all. Understanding where disparities in water access exist helps authorities prioritize interventions and investments to bridge these gaps and make progress towards achieving SDG targets.

3. Aim and Objectives

The aim of this study is to address the spatial inequality of domestic water access in Ibadan North LGA, Nigeria. The objectives are to:

1. Identify socio economic factors contributing to these disparities
2. Identify the Source of domestic water supply in Ibadan North LGA
3. Identify the proximity to the nearest water supply in the study area
4. Identify water accessibility in the study area.

4. Hypotheses

1. Spatial inequality in water access is significantly influenced by socio economic factors.
2. Domestic water source is significantly accessible to all resident in Ibadan North LGA Nigeria.
3. There is a significant access to proximity among certain population in Ibadan North LGA Nigeria.

5. Study Area

Ibadan North LGA is in Oyo state which is domiciled in the Southwest geopolitical part of Nigeria. The location on the map is between latitude 7º 38'N and 7° 44´N 44´N and longitude 3º 88' E and 3° 95É. The headquarters of the LGA are domiciled in the Bodija district of Ibadan (figure 1.0). The LGA is bordered by the Akinyele, Lagelu, Egbeda, Ibadan Northwest, and Ibadan Northeast LGAs. Ibadan North LGA is an urban center and is made up of several districts and streets such as Bodija, Agodi, Oyelade crescent, Ladoke Akintola street, Oyo Road, and Sango. The projected population of Ibadan North LGA is 440,400 as at 2022 inhabitants with the vast majority of the area's dwellers being members of the Yoruba ethnic group.

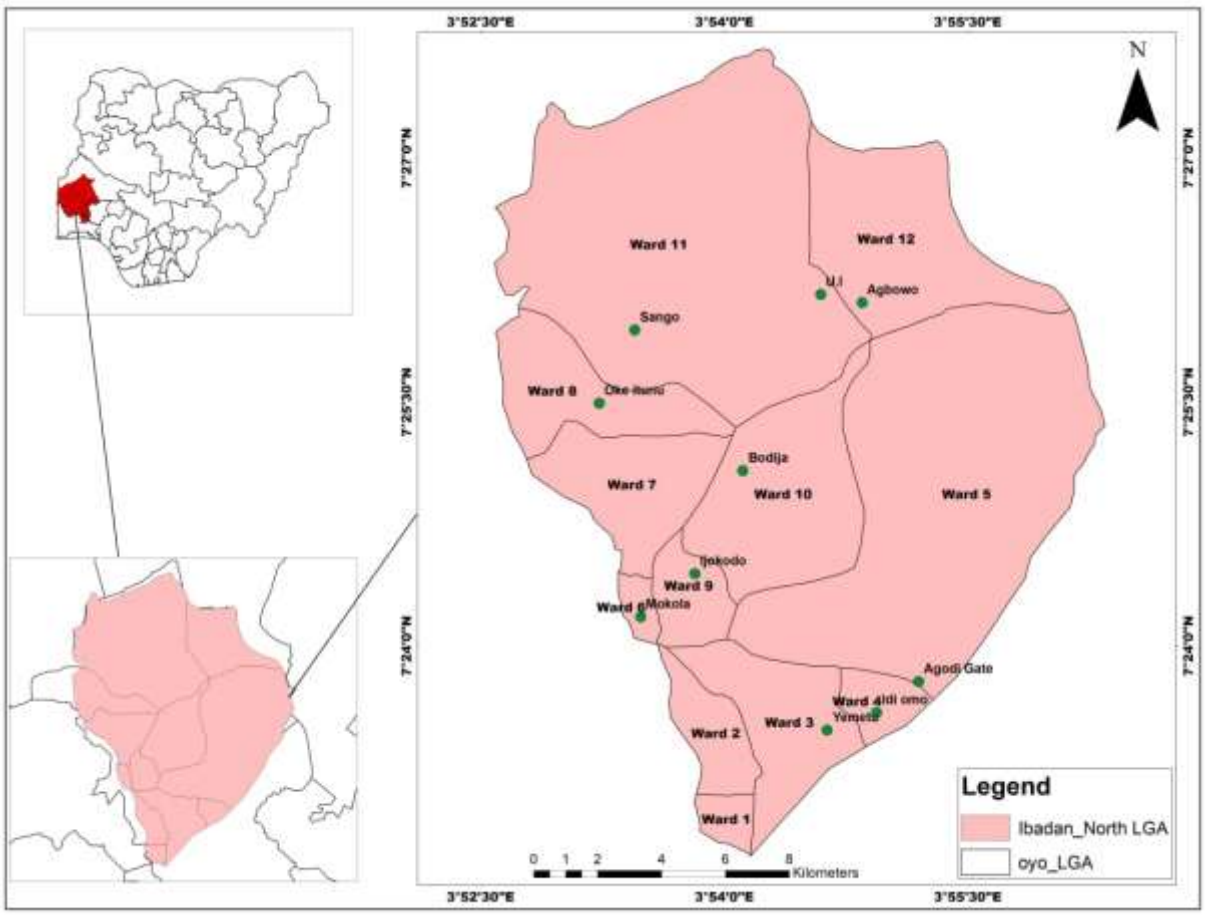

Figure 1 Study Area
Source: Author

METHODOLOGY

Primary data was used to address the objectives and hypotheses of this research. The primary data include the use of a well-structured questionnaire in the collection of information from the respondents on the source of domestic water supply, proximity to the nearest water supply and the level of accessibility in the study area. Purposive Sampling technique was used in this research, the population data was projected from 2006 census. This sampling technique was used because of limited access to some certain areas. Community like Sango, Oke Itunu, Mokola, Yemetu, Agbowo, University of Ibadan, Ijokodo, Idi Omo and Bodija were administered 40 questionnaire each based on Taro Yamane formula covering the twelve wards in Ibadan North LGA.

6. Sampling Technique

Taro Yamene sampling size and household research design was used to calculate the population size given;

Taro Yamane formula is n = N/1+N(e)2

Where; n represents sample size

N represents total population e represents level of significance

1 represents constant value

n = N/1+N(e)2

n =?

N = 440,400

e = 5/100 = 0.05

Therefore:

440,400/1+440,400(0.0025)

= 440,400/1,101

n = 400

7. Data Analysis

Version 20 of the statistical package for social sciences (SPSS) was used to evaluate the data employed for this study. Descriptive and inferential statistics were used to represent the results and the results was displayed using tables, frequency and maps.

RESULTS AND DISCUSSION

Socio-Economic and Demographic Characteristics

Table1. indicates that 56% of the participants were identified as female. This suggests a higher representation of female respondents among the surveyed population which goes in line with the findings of the United Nations development program (UNDP) emphasizes that women contribute up to 80% of water labor force in some regions. Women play a critical role in water management and are often the primary water collectors and managers in many regions around the world. In rural areas, women and girls are commonly responsible for fetching water from distant sources, which can be time-consuming and physically demanding. Several studies and reports highlight the significant contribution of women to water-related activities. The research findings concerning the age of respondents demonstrated that 40% were aged between 26-35 years, 33% were within the 36-45 years age ranges. It was revealed from the findings of this study that 58% of the respondents were married, 22% were single. The study's findings indicated that among the respondents, 39% were self-employed. It also indicated that 39% earned between ₦30,000 and ₦60,000. The data suggests that over 30% of the respondents earn an income surpassing ₦30,000, which is considered above the minimum wage threshold.

Table 1: Socio-demographic Characteristics of Respondents

Socio-demographic Characteristics of Respondents	Variables	Frequency	Percentage (%)
Sex	Male	176	44
	Female	224	56
Age of Respondents	15-25years	52	13
	26-35years	160	40
	36-45years	132	33
	46years and above	56	14
Marital Status	Single	88	22
	Married	232	58
	Divorced/Widowed/Separated	80	20
Employment Status	Employed	120	30
	Unemployed	92	23
	Self employed	156	39
	Students	32	8

Monthly Income	Below N30,000	66	16.5
	N30,000-N60,000	156	39
	N61,000-N90,000	96	24
	N91,000 and above	82	20.5
Total		400	100%

Source: Field Survey 2023

Spatial Pattern of Domestic water Supply in the Study area

The primary source of domestic water supply in the study area is majorly pipe borne water, hand dug well, bore holes and streams. The findings of this study in table 2. reveals that 34.5% of the respondents get their source of water from hand dug well, 33.5% from borehole, 30.5% from pipe borne water and 1.5% from stream /ponds. Majority of the residents in the study area uses hand dug well as their source of domestic water supply because the residents attested that the cost of constructing pipe borne water and boreholes is more compared to hand dug well and most of the wells have been there for a very long period of time. Hand dug well was a major source of domestic water supply right from the ancient time unlike this modern period where people use pipe borne water and bore holes. The distribution of boreholes and piped water systems can vary depending on various factors such as geographical location, population density, and availability of water resources in the study area.

Table 2: Source of domestic water supply

Wards		**Pipe borne Water**		**Hand dug well**		**Borholes**		**Streams/ponds**		**Total**	
		F	**(%)**	**F**	**(%)**	**F**	**(%)**	**F**	**(%)**	**F**	**(%)**
W11	**Sango**	10	25	10	25	20	50	0	0	40	100
W11	**UI**	13	30	15	32.5	6	37.5	6	0	40	100
W6	**Mokola**	13	32.5	17	42.5	10	25	0	0	40	100
W3	**Yemetu**	17	42.5	15	37.5	8	20	0	0	40	100
W12	**Agbowo**	12	30	15	37.5	13	32.5	0	0	40	100
W8	**Oke Itunu**	12	32.5	13	37.5	15	15	0	1.5	40	100
W5	**Agodi**	18	45	20	50	2	5	0	0	40	100

W9	**Ijokodo**	7	17.5	10	25	23	57.5	0	0	40	100
W4	**Idi Omo**	10	25	14	35	16	40	0	0	40	100
W10	**Bodija**	10	25	9	22.5	21	52.5	0	0	40	100
	Total	122	30.5	138	34.5	134	33.5	6	1.5	400	100

Source: Field Survey 2023

Spatial distribution of Access to pipe borne in the study area

In table 2. and figure 2, it is evident that a majority of respondents (122) in the study rely on pipe-borne water. Ward 11 stands out with a substantial percentage of 57.5%, while Ward 9 exhibits a comparatively lower percentage of 17.5%. The preference for pipe-borne water in the study area is attributed to its convenience and easy accessibility.

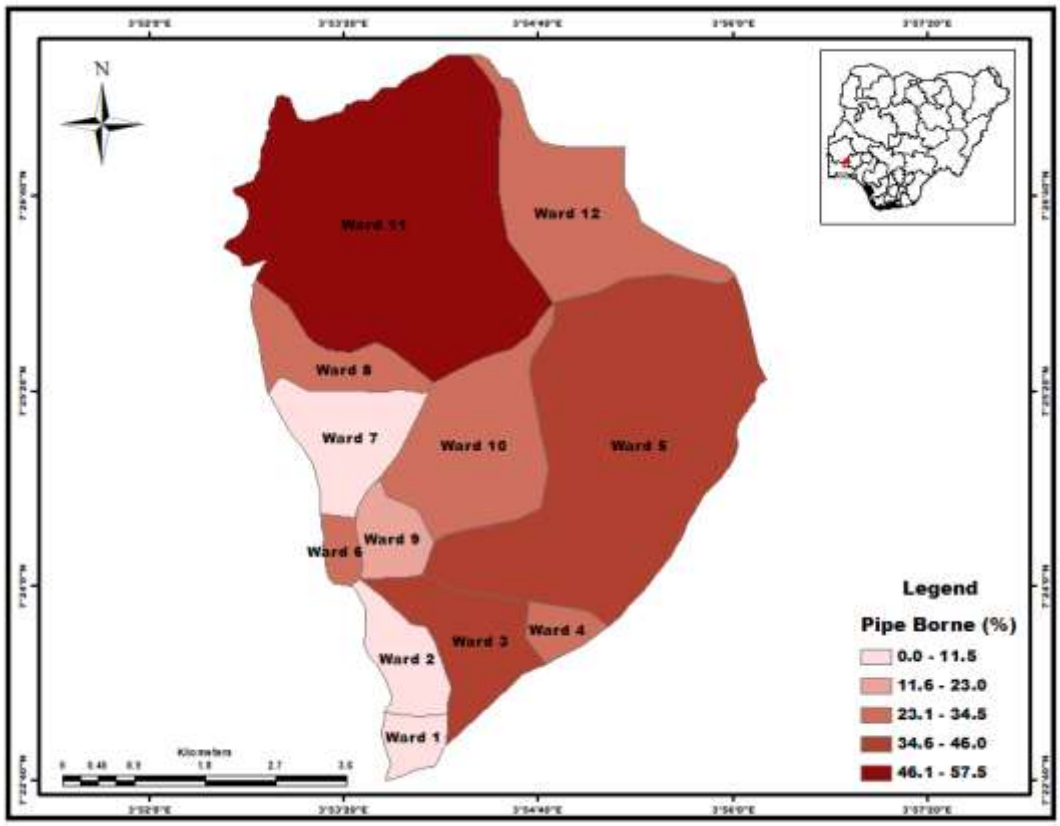

Figure 2: Spatial distribution of access to pipe borne in the study area
Source: Field Survey 2023

Spatial distribution of access to Hand dug well in the study area

Figure 3 and table 2 indicate that a considerable number of respondents (138) rely on hand-dug wells. Ward 11 exhibits the highest percentage, with 62.5% of residents using hand-dug wells, while Ward 10 has the lowest percentage at 22.5%. The prevalence of hand-dug wells in Ward 11 is attributed to the presence of ancient buildings in the area and the limited availability of alternative water sources. This finding aligns with Muhammed et al.'s (2015) research, which highlights the widespread use of hand-dug wells in the ancient city of Bauchi metropolis.

The lower utilization of hand-dug wells in Ward 10 can be linked to their role as a secondary domestic water supply in this region. Additionally, being a newly developed area in Ibadan, modern domestic water sources have been prioritized. This observation aligns with Okoro et al.'s (2017) study, which emphasizes the clustered pattern of borehole usage in new sites in Enugu state.

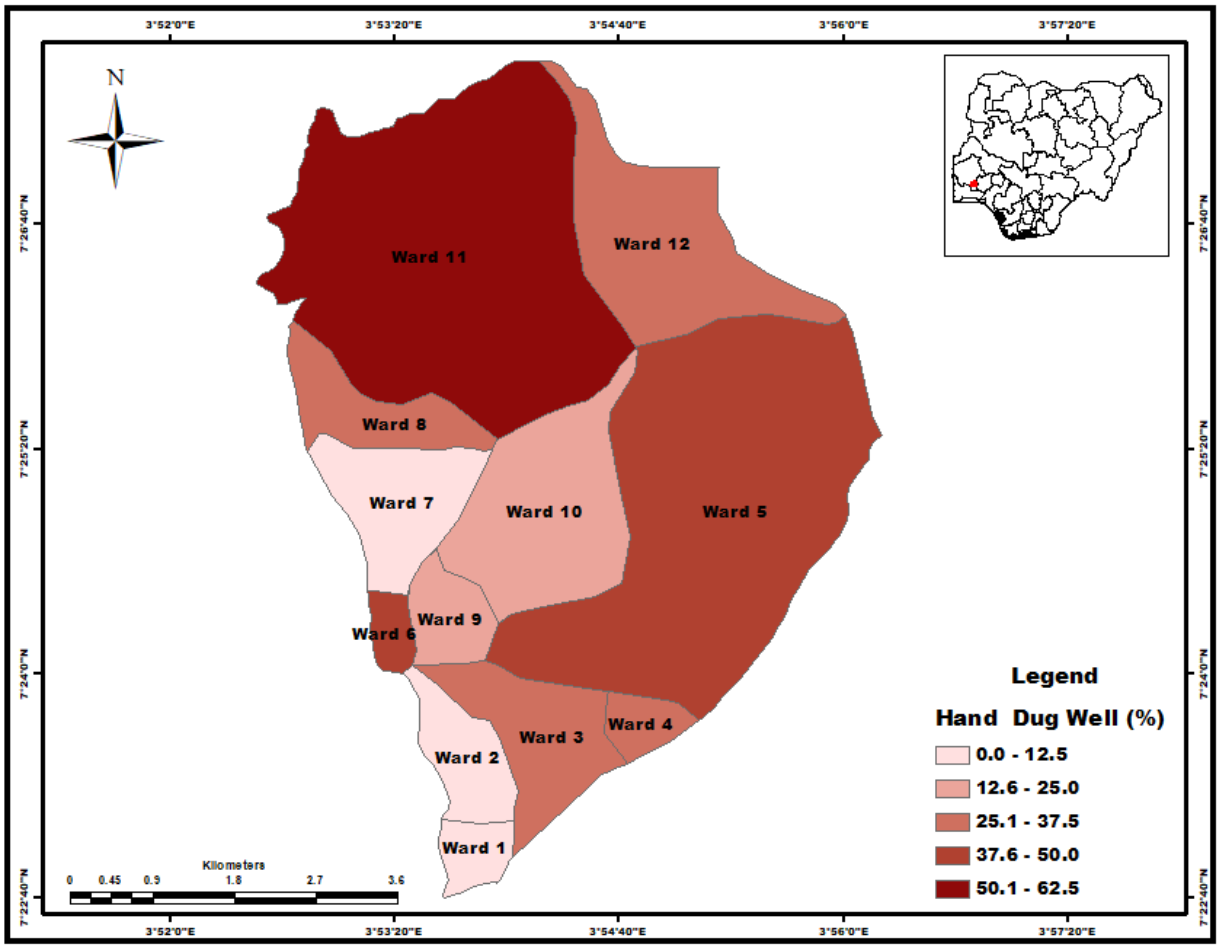

Figure 3: Spatial distribution of access to hand dug well in the study area

Source: Field Survey 2023

Spatial distribution of access to bore holes in the study area

Figure 3 and table 2 reveal that a significant number of respondents (134) utilize boreholes. Ward 9 stands out with 57.5% of residents using boreholes, while Ward 5 has the lowest usage at 5%. The high adoption of boreholes in Ward 9 is linked to its status as a new development area, where residents are increasingly turning to boreholes as a modern method of domestic water supply. This trend aligns with Okoro et al.'s (2017) findings, emphasizing the highest usage of boreholes in new sites in Enugu state compared to the more established areas in the region. The minimal usage of boreholes in Ward 5 can be attributed to the availability of alternative options for domestic water supply, as reported by the residents.

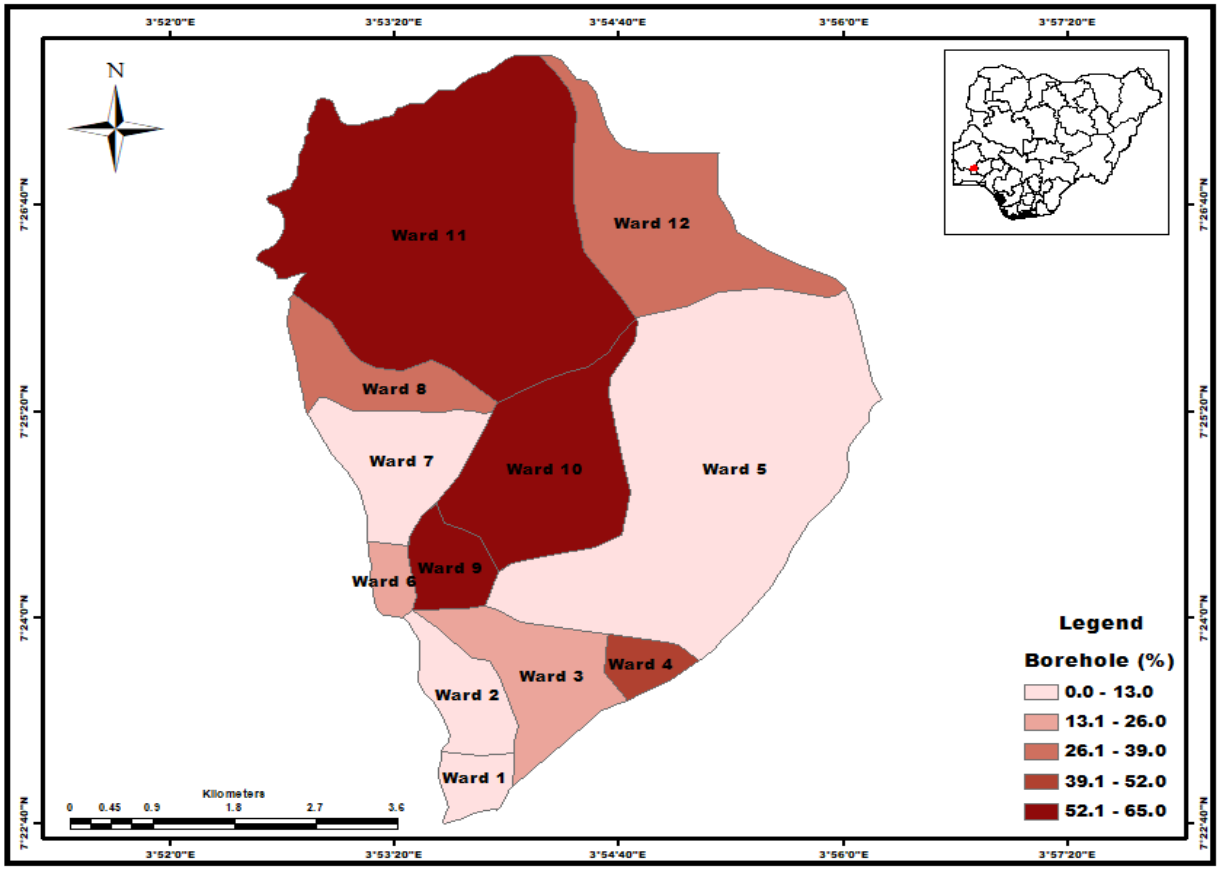

Figure 4: Spatial distribution of access to boreholes in the study area
Source: Field Survey 2023

Spatial distribution of access to stream/ponds in the study area

The outcomes of this study, as depicted in Figure 4 and table 2, highlight those 6 respondents, constituting 15%, acknowledged the use of streams in the study area. Strikingly, Ward 11 emerges as the sole region utilizing water from streams and ponds for domestic water supply in the study area. Streams and ponds play a supplementary role in providing domestic water in this community, particularly for residents who face financial constraints and cannot afford the costs associated with pipe-borne water and borehole water.

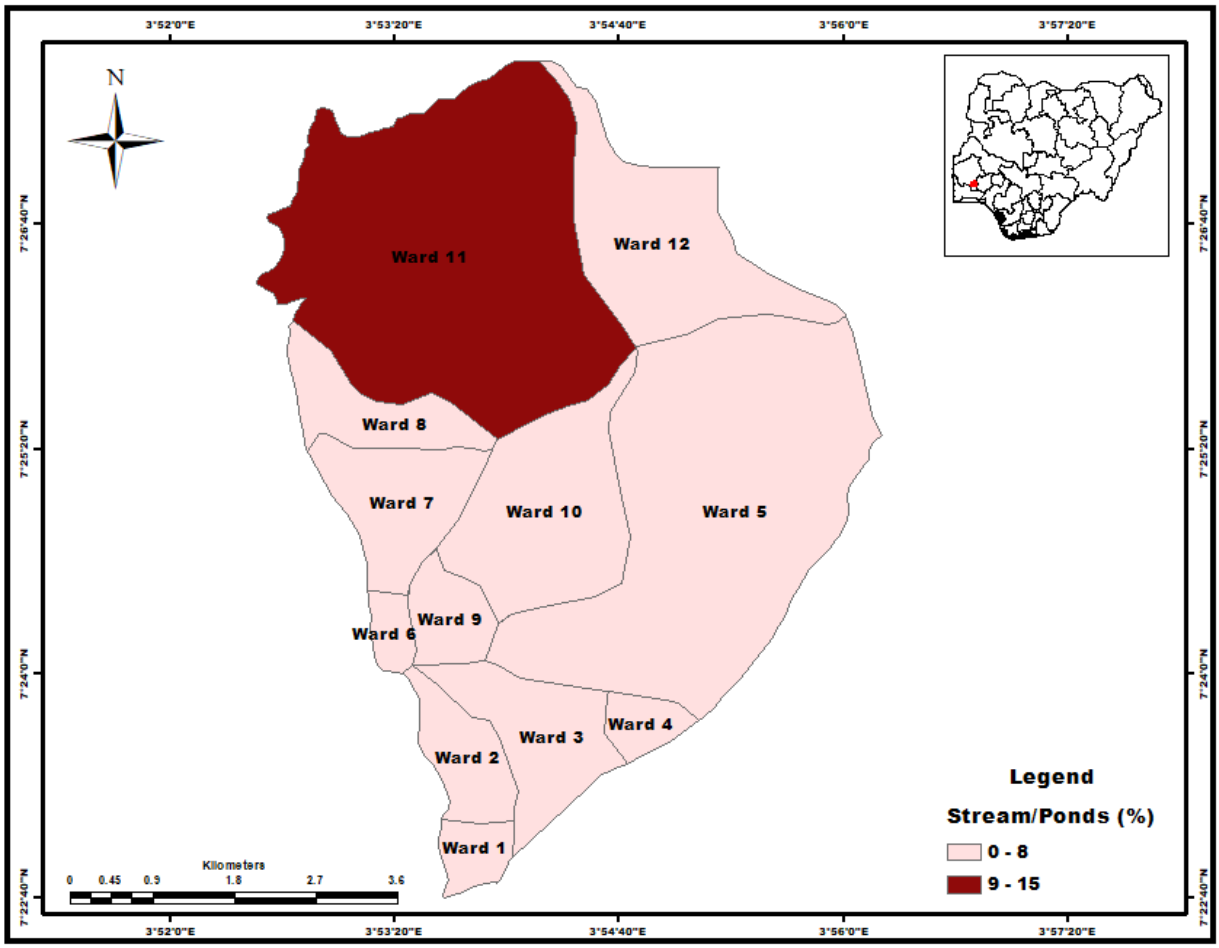

Figure 5: Spatial distribution of access to streams/Ponds water in the study area

Source: Field Work 2023

Proximity to the nearest water supply

Figure 6 to 8 and table 3 revealed the number of respondents to be 244 and 106 respectively. Ward 3 (72.5%) attest that their house is very close (1-15minutes) to the nearest water source. While ward 9 (75%) says that their house is close (16-30minutes) to the nearest water supply. When a house is closer to the source of domestic water supply, it typically benefits from a direct water distribution system. This means that the water flows from the source directly to your house, resulting in minimal pressure loss and a more efficient supply. Direct existing water distribution (table 3) typically involves a direct connection between the source of water supply, such as a reservoir or a water treatment plant, and the end users. This was in support of Oyebande (2005) that found that settlements that are provided with modern water supply networks are usually those situated along the major transportation networks and all improved water supply in Nigeria is from

public water supplies. This means that water flows directly from the source through a network of pipes to homes, businesses, and other establishments.

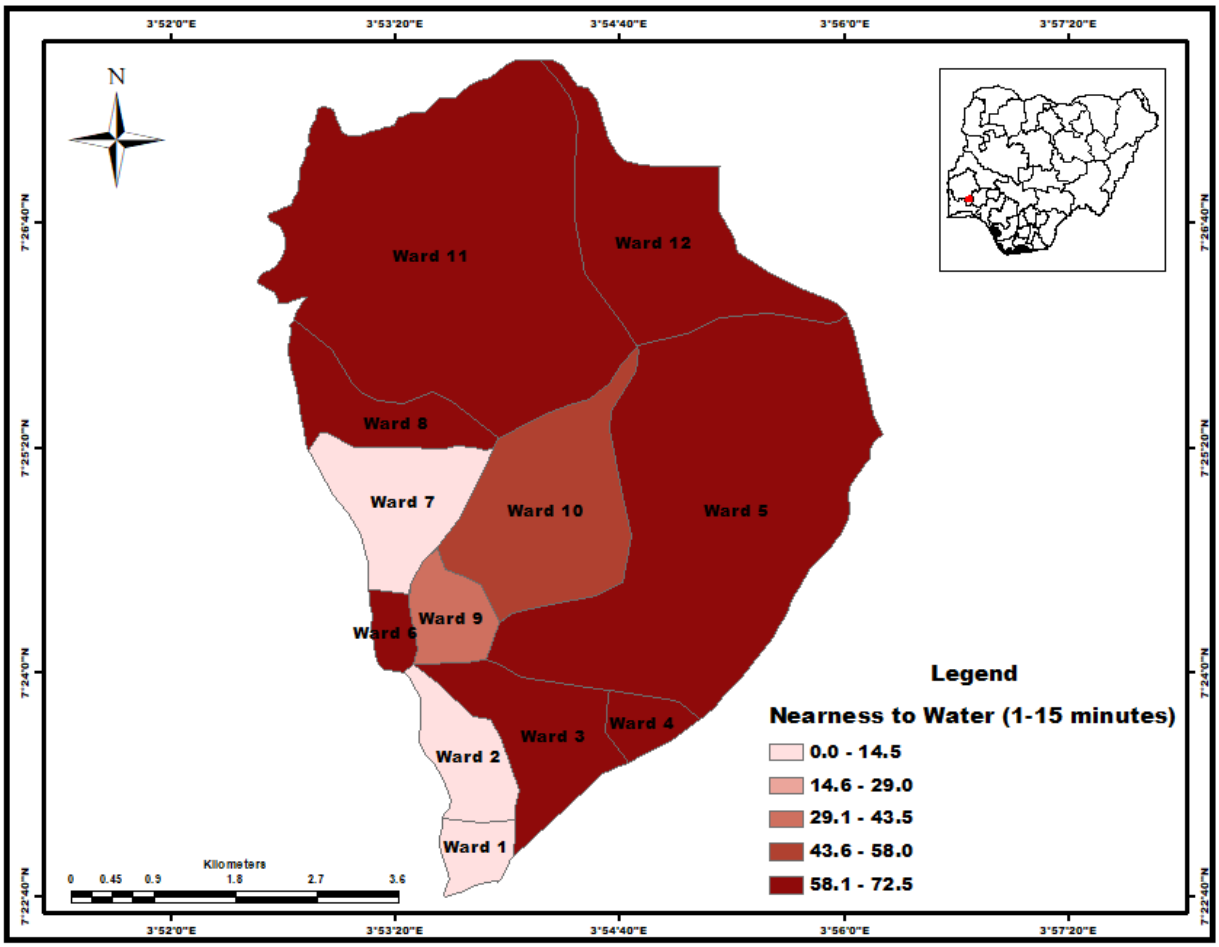

Figure 6: Nearness to water source (1-15minutes)

Source: Field Work 2023

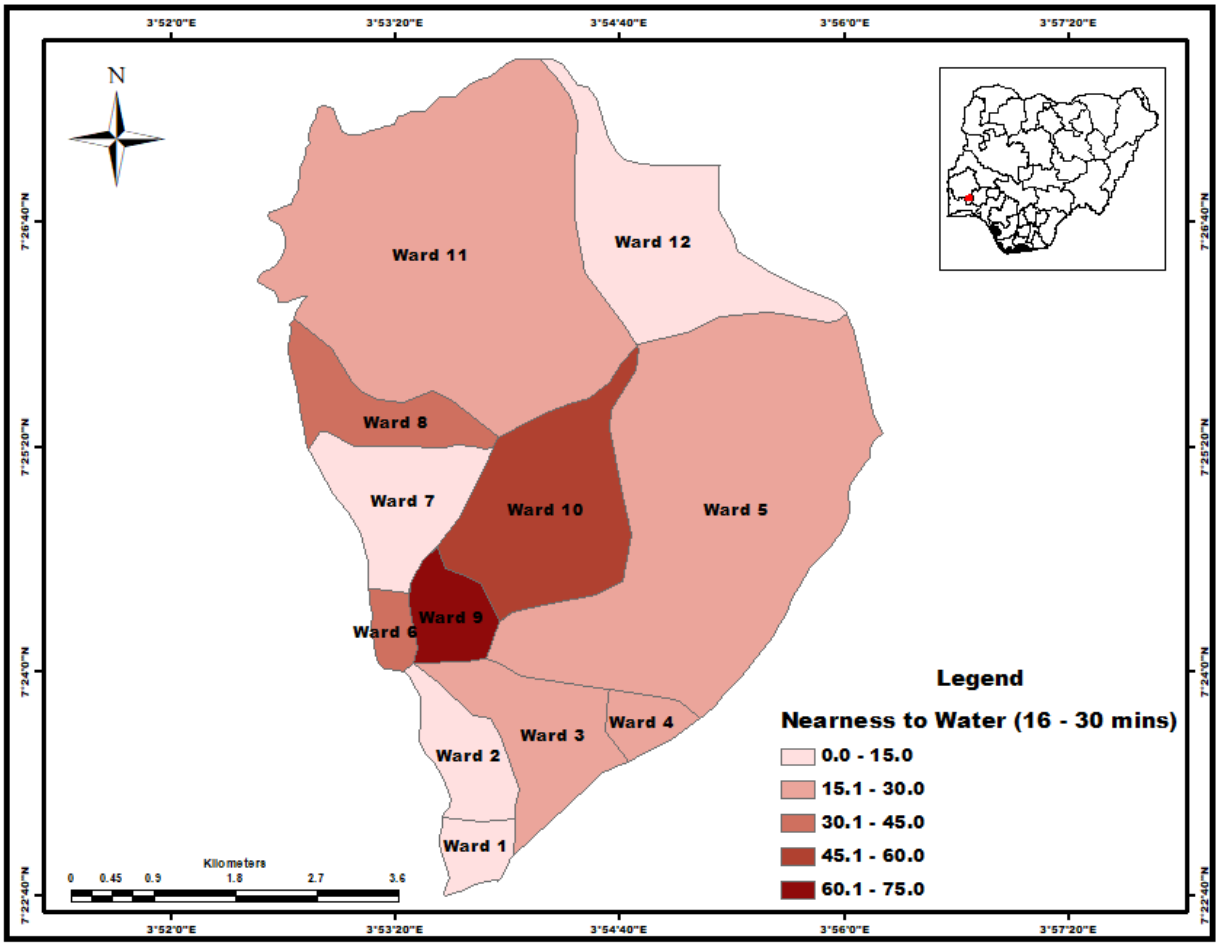

Figure 7: Nearness to water source (16-30minutes)

Source: Field Work 2023

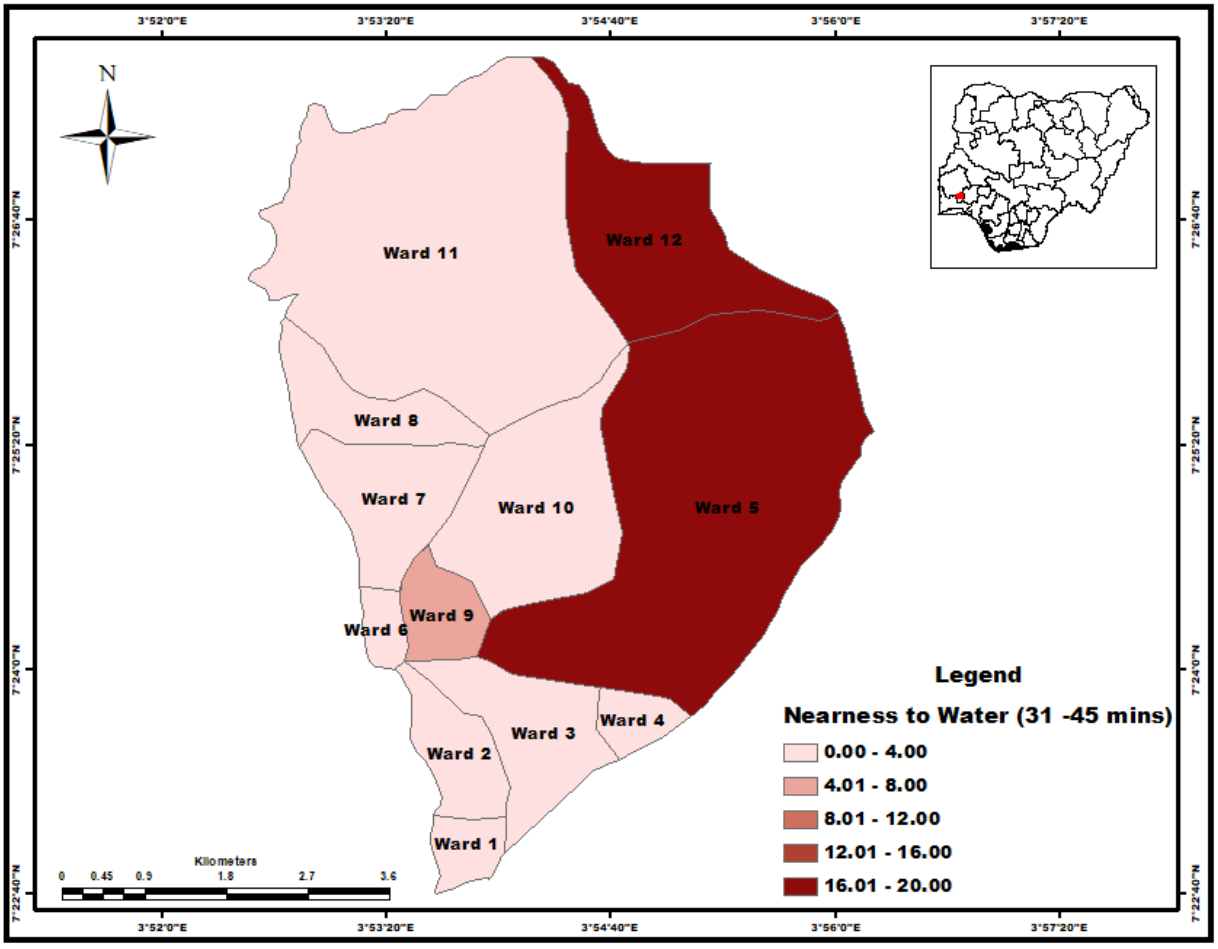

Figure 8: Nearness to Water in the study Area (31-45minutes)
Source: Field Survey 2023

Figure 8 shows that 20% in ward 12 attest that their house is very far (31-45minutes) to the nearest water supply source. The Resident in ward 12 attest that they travel longer distance to fetch water and rely on alternative sources such as wells or tanks. This can be time-consuming and may pose difficulties in terms of water availability during emergencies or situations that require immediate access to clean water in those areas. This agrees with the findings of PD Adah et al, (2013) which observe the challenge of urban water management in Nigeria it stated that challenges of urban water management in cities are as a result of rapid urbanization and poor state of infrastructure.

Table 3. Proximity to the nearest water supply

Wards		Very close F	(%)	Close F	(%)	Far F	(%)	Total F	(%)
W11	**Sango**	27	67.5	12	30	1	2.5	40	100
W11	**UI**	24	60	6	15	10	20	40	100
W6	**Mokola**	25	62.5	15	37.5	0	0	40	100
W3	**Yemetu**	29	72.5	11	27.5	0	0	40	100
W12	**Agbowo**	26	60	7	15	7	20	40	100
W8	**Oke Itunu**	24	60	15	37.5	1	2.5	40	100
W5	**Agodi**	24	65	6	17.5	10	17	40	100
W9	**Ijokodo**	28	20	12	75	0	5	40	100
W4	**Idi Omo**	17	70	3	30	2	0	40	100
W10	**Bodija**	20	50	19	47	1	2.5	40	100
Total		244	61	106	26.5	50	12.5	400	100

Source: Field work 2023

Water Accessibility in Ibadan North LGA

The findings in figure 9 shows that ward 11 has 62% respondents who have access to water. A high level of accessibility in ward 11 means that the water supply is readily available, reliable, and easily accessible within a reasonable distance from homes or communities. This could include having a piped water connection directly to households or access to a communal water source nearby. A low level of accessibility as experienced in ward 3 and ward 8 in table 4, indicates challenges or limitations in accessing water. This could involve having to travel long distances to fetch water from a distant source, relying on inconsistent or unreliable water sources, or lacking access to basic water infrastructure. The findings of this study corroborate with the findings of

(Odjegba *et al.*, 2015) who reported insufficient water supply due to population pressure and inadequate distribution/coverage of public water supply in Abeokuta Southwest, Nigeria.

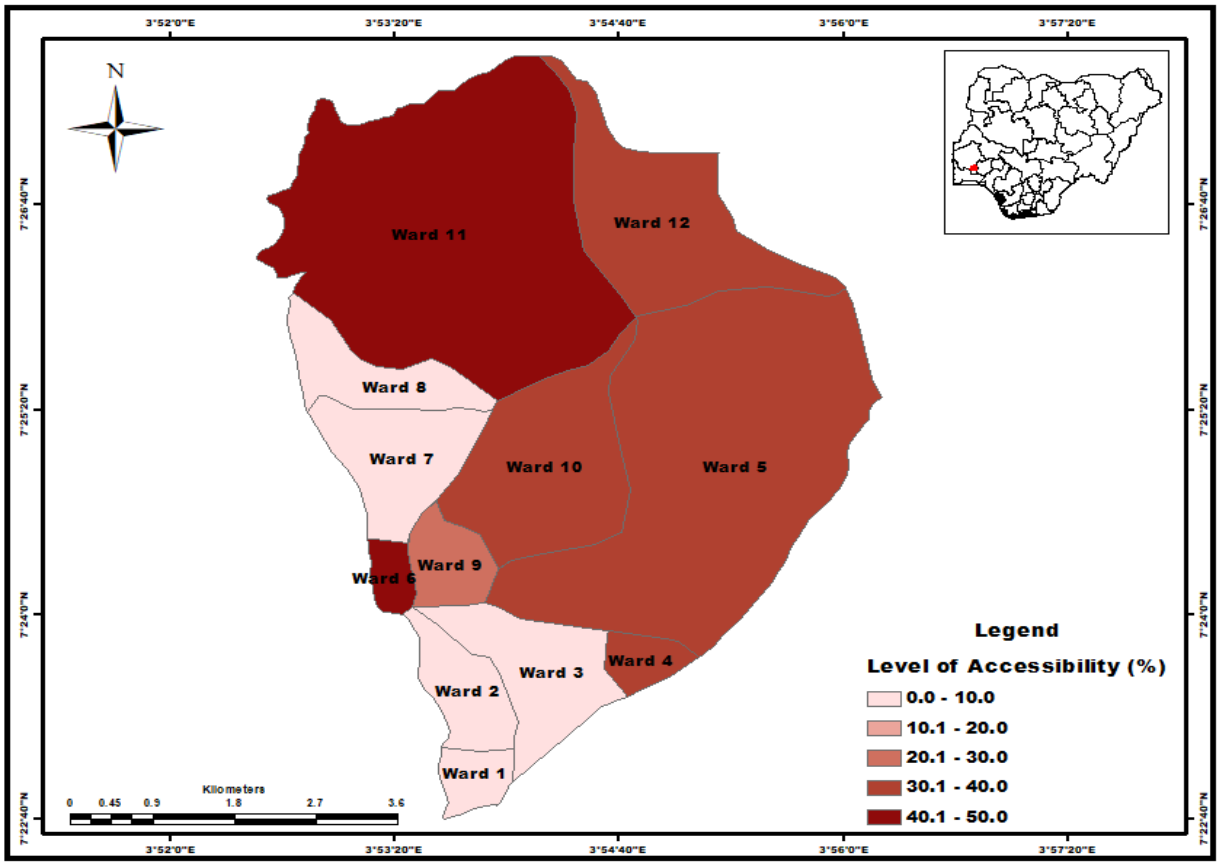

Figure 9: Water Accessibility in the study area

Source: Field work 2023

Table 4. Water accessibility in the study area

Wards		YES (F)	(%)	TOTAL (F)	(%)
W11	**Sango**	10	25	40	100
W11	**UI**	10	25	40	100
W6	**Mokola**	19	47.5	40	100
W3	**Yemetu**	4	10	40	100
W12	**Agbowo**	15	37.5	40	100
W8	**Oke Itunu**	13	10	40	100
W5	**Agodi**	15	37.5	40	100
W9	**Ijokodo**	10	25	40	100
W4	**Idi Omo**	13	32.5	40	100
W10	**Bodija**	13	32.5	40	100
Total		122	30.5	400	100

Source: Field work 2023

Conclusion

This study identified the spatial inequality of domestic water access in Ibadan North LGA Nigeria. Spatial inequality in water access is the unequal distribution of access to clean and reliable water sources across different geographical areas. This inequality is influenced by various socioeconomic and demographic factors, which means that people's access to water can be influenced by their economic status, level of education, age, and other demographic characteristics. Areas with lower socioeconomic status, there may be limited infrastructure and resources available to ensure adequate water supply and sanitation services.

In this study it was revealed that pipe borne water, hand dug well and bore holes are the major source of domestic water supply in Ibadan North LGA Nigeria. The existing water distribution can be a direct distribution or indirect distribution which influence proximity. Resident in ward 3 and ward 9 attest that their house is close to the existing water distribution and ward 11 travels longer distances to fetch water or rely on alternative sources such as wells or tanks. Ultimately, the choice between direct and indirect existing water distribution depends on various factors, including the size and needs of the community, as well as the infrastructure available. Ward 11 has 62% respondents who have access to water.

Study also shows that proximity of a house to the water supply or the satisfaction level of individuals with the current water distribution does not guarantee water accessibility in the study area. In other words, the distance from a house to the water source and the satisfaction level with the current distribution system do not affect how easily people can access water in that particular area. Factors, such as infrastructure, resource management, or government policies, may have a stronger influence on water accessibility in the study area.

Recommendations

Households in Ibadan should be provided with adequate and sufficient water through the provision of water supply infrastructure by the government, NGOs, CBOs in order to aid the ease to obtain water by the respondents. The provision of water should be supported by effective cost recovery framework in order to ensure the sustainability off the supply. The public must be properly enlightened on proper maintenance of water resources provided within the study area.

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