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Research Paper

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An Assessment of Borehole Conditions and Impact on Access to Water Supply in Vandeikya L.G.A., Benue State.

Ahile, Stephen Iorlumun¹, Ityavyar, Evelyn Mngohol², Tyav, Thomas Terungwa³

^{1&2} (Department of Geography, Akawe Torkula Polytechnic, Makurdi.)

³ (Department of Sociology, Akawe Torkula Polytechnic, Makurdi.)

ABSTRACT: Water is regarded as a very important resource which is central to the achievement of sustainable development. Despite of importance of this resource, many people, particularly those living in rural areas of developing countries lack access to a sufficient supply of water. This paper examines the spatial pattern and conditions of boreholes in Vandeikya L.G.A and their impact on household access to water. The study employed multiple sampling techniques; purposive sampling, simple random sampling and systematic random sampling, for selection of communities and households for questionnaire administration, using a sample size of 385 respondents. The study employed frequencies, percentages and cross-tabulation for data analysis. Based on the template adopted for measuring access to water, findings show that 56.3% of respondents do not have access to borehole water supply; 31.8% have basic access, 10.6% have intermediate access, while 1.6% have optimal access. Findings also show little variation in access to borehole water supply across sampled communities. Data on boreholes and their conditions was then cross-tabulated with the variation in level of access to determine the impact of borehole conditions on access to water in the study area. This paper concludes that the problem of rural water supply remains the sustainability of water infrastructure, which is mainly affected by poor management and maintenance.

KEYWORDS: Borehole conditions, Access to Water, Rural Water, Households, Vandeikya

I. INTRODUCTION

"There is a water crisis today. But the crisis is not about having too little water to satisfy our needs. It is a crisis of managing water so badly that billions of people suffer badly" World Water Vision Report, 2010.

The importance of water to life and its centrality in the achievement of sustainable development is widely acknowledged in the literature. Nigeria is known to be endowed with abundant water resources but the access to potable water for the people remains a problem in many parts of the country, particularly in the rural areas[1]. As rightly captured in the epigraph above, the water problem in Nigeria is an issue of poor management. Considerable investments have been made in rural water supplies over time, but rural water supply coverage remains significantly low. The underlying issue remains the sustainability of water infrastructure (particularly boreholes). It is estimated that only two out of three handpumps/boreholes installed in developing countries are working at any given time [2]. In Nigeria, available statistics show that more 50% of boreholes installed are not working; some have been completely abandoned [3;4]. Without water infrastructure that will provide a sustainable supply of water, the number of people without access to potable water supply will continue to increase.

In Vandeikya L.G.A the people suffer from acute water scarcity. Pipe water connection to homes is non-existent, hence people depend on the boreholes and other unhygienic sources for their water needs. This paper assesses the spatial distribution and condition of boreholes and the effect this has on access to water for the people.

II. MATERIALS AND METHODS

2.1 Study Area

Vandeikya Local Government Area, created in 1976 from the defunct Gboko Division, is located between latitude 7°51' and 7°15' North and longitude 9° and 9°6' East. It has a landmass of 183,939 square meters with a population of well over 344,462 people [5].

The local government is located in the south eastern part of Benue State (figure 1) and shares boundary with Obudu and Bekwara in Cross River State to the east, Ushongo to the north and Konshisha to the west. There are twelve administrative council wards in Vandeikya L.G.A, which include Mbadede, Tsambe, Mbajor, Ningev, Vandeikya Township, Mbagbera, Mbagbem, Mbakaange, Mbakyaha, Mbatyough, Mbayongo and Nyumangbagh (figure2).

Vandeikya L.G.A falls within the tropical sub humid which corresponds with the Koppen’s Aw climate classification. There are two distinct seasons: the rainy and dry seasons. The wet season starts from April to October (with a short break in August) and sometimes extends to early part of November.

The study area is drained by rivers such as Aya, Be, Sambe and Uaghshu, which are predominantly seasonal in nature. These rivers serve as a major source of water supply for the rural population.

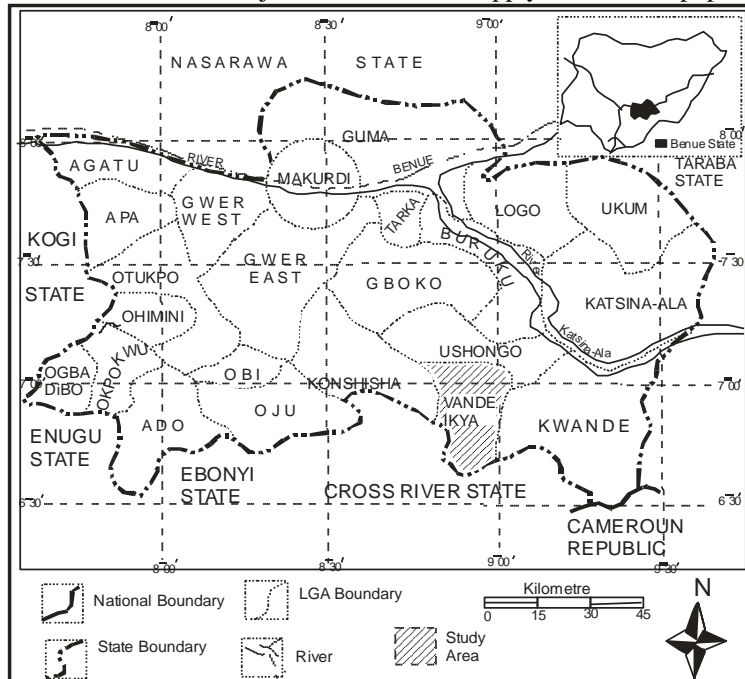


Fig: 1.1 Map of Benue State Showing Vandeikya Local Government Area
Source: Ministry of Lands and Survey Makurdi

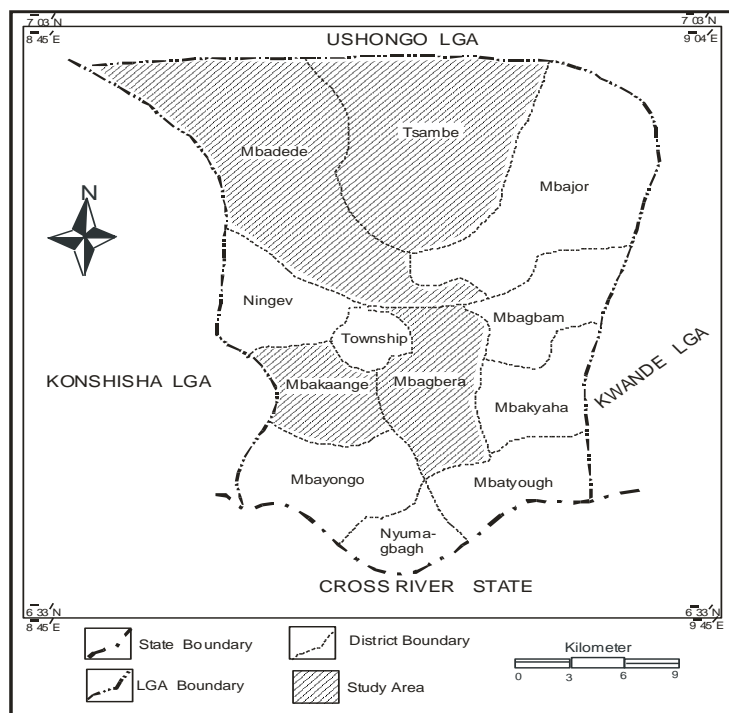


Figure 1.2: Map of Vandeikya Local Government Area Showing the Study Areas
Source: ministry of Lands and Survey, Makurdi

2.2 Data Collection and Analysis

Questionnaire was the major data collection tools employed in this study. Purposive sampling was used to choose six council wards from the twelve (12) that make up the local government area. These council wards include Mbatyough, Mbagbera, Vandeikya Township, Mbajor, Tsambe and Mbadede. These are the council wards with the most challenging water supply issues. Twelve communities, two from each council ward, were selected for the study. Simple random sampling was employed to select the households in the communities for questionnaire administration. The questionnaire was administered to 385 respondents.

Data was analyzed using the Statistical Package for Social Sciences (SPSS) for production of tables (including frequency counts and percentages). Access to borehole water supply was measured based on the standard advanced by [6]. Access to water is measured according to the availability of a water source next to the house (not more than 1000 meters from the house) where people can draw water at least 30 litres/individual/day, within a time frame of not more than 30 minutes. These variables were then used to determine the levels of access to water in the study area expressed as Optimal access, Intermediate access, Basic access and No access (see table 1 below). This information was further used to determine the spatial variation in the level of access to borehole water supply across the sampled communities.

Table 1. Levels of Access to Water

Distance to borehole	Qty of water collected	Avg. time spent	Level of access
More than 1000m	Below 5L/cap/day	More than 30 mins	No access
Btw 100-1000m	Not more than 20L/cap/day	5-30 mins	Basic access
Less than 100m	About 50L/cap/day	5 mins	Intermediate access
Water point within the household	100L/cap/day and above	Below 5mins	Optimal access

Source: [6]

Information on boreholes and their condition was obtained from the Works Department of Vandeikya Local Government Council Headquarters. This was then correlated with the variation in level of access to determine the impact of borehole conditions on access to water in the study area.

III. DISCUSSION OF RESULTS

3.1 Boreholes and their Distribution across Vandeikya L.G.A.

To find out the number of boreholes in Vandeikya L.G.A, data was collected from the Department of Works in the Local Government Headquarters and was collaborated by field observation and checks. The data presented in table 2 below shows that there are one hundred and twenty one (121) boreholes spread across the Twelve Districts of the L.G.A.

Table 2. Number of Boreholes in Vandeikya L.G.A and their status.

S/No	District/Ward	No. of Boreholes	No. Functioning	No. not Functioning
1	Mbayongu	7	1	6
2	Mbagbera	7	3	4
3	Mbadede	27	10	17
4	Tsambe	8	2	6
5	Mbajor	8	2	6
6	Vandeikya Township	13	4	9
7	Mbagbam	8	1	7
8	Mbakaange	8	3	5
9	Ningev	8	3	5
10	Mbakyaha	7	2	5
11	Mbatyough	12	4	8
12	Nyumagbagh	8	---	8
	Total	121	35	86

Source: Works Department, Vandeikya Local Government Headquarters.

A further breakdown shows that Mbadede district has the highest number of boreholes (27), followed by Vandeikya Township (13) and Mbatyough (12). The spatial distribution of boreholes across Vandeikya L.G.A is presented in figure 3 below.

In terms of the functionality status of boreholes, data shows that most of the boreholes are not working; precisely 86 boreholes are not functioning, translating to 71.7% of boreholes in Vandeikya L.G.A. This means that only 35 boreholes, translating to only 28.9% which are functional. Observation from field survey done in the course of this study shows that the situation is worse than what is depicted in the table above. In most of the communities sampled, it was difficult to find two boreholes that were functional. This situation of a deficit in boreholes can affect household access to water across the L.G.A.

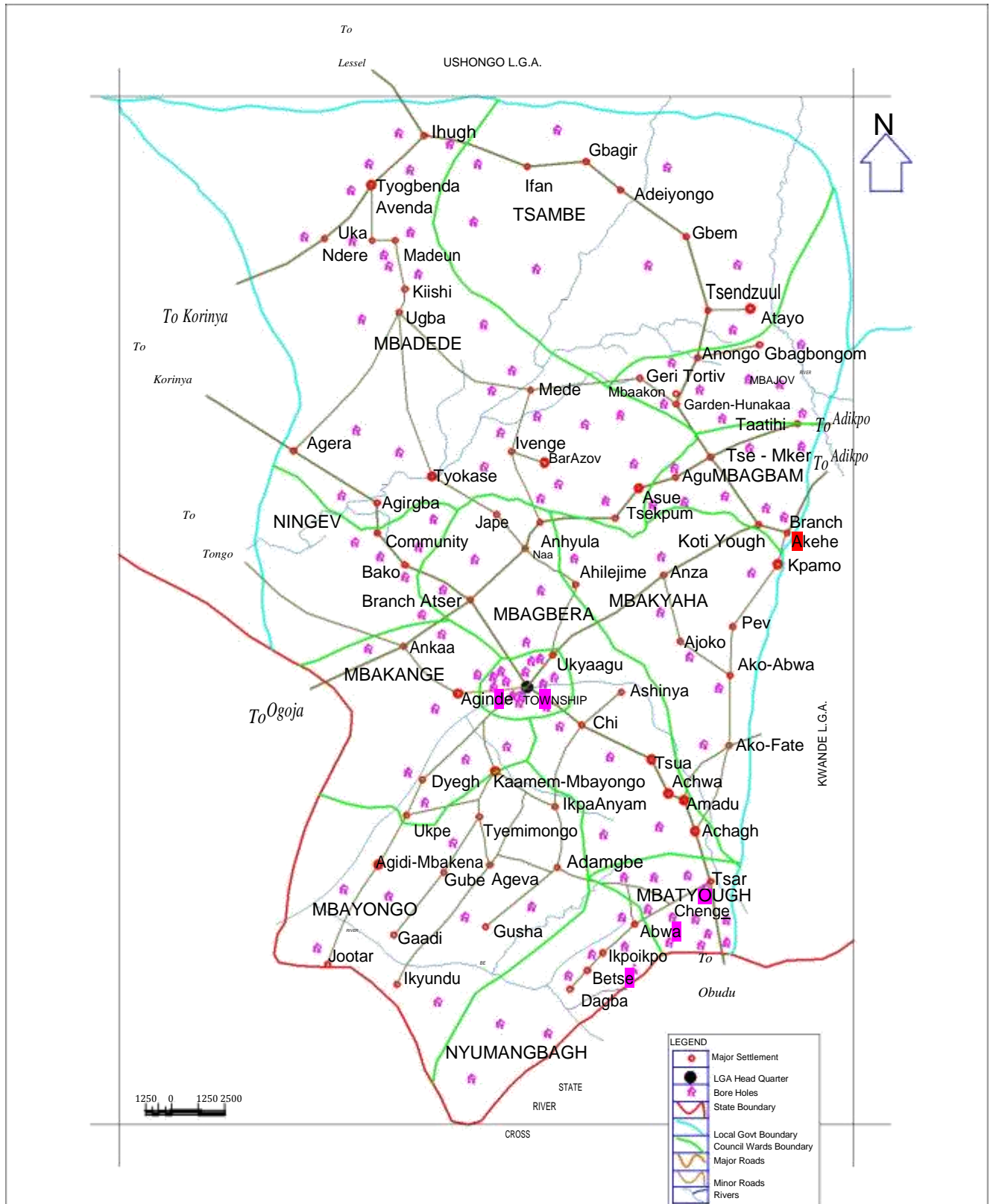


Figure 3. Vandeikya Local Government Showing Distribution of Boreholes

3.2 Contribution of Boreholes to the Water Supply of Residents.

Respondents were asked to indicate the source of water they mostly depend on for their water supply. Their responses are presented in table 3. The results show that 38.8% of respondents depend on boreholes for their water supply; 45.4% of the respondents depend on protected/hand dug wells for their water supply, 5.9% of respondents depend on rainwater for their water supply, 9.9% of respondents depend on streams, rivers and lake, while there were no respondents depending on public tap water and spring water.

Table 3. Contribution of water sources to water supply for residents.

Source of water	Frequency	Percentage (%)
Borehole	98	38.8
Protected hand dug well	114	45.4
Rainwater	15	5.9
Public tap water	---	---
Spring water	---	---
Stream, river, lake	25	9.9
Total	252	100

Source: Authors' fieldwork, 2018.

The overall results shows that protected/hand dug wells makes the highest contribution to the total supply of water for the residents. This is followed by boreholes and then streams, rivers and lakes. This result agrees with the earlier assertion of this study that public water supply in Vandeikya L.G.A is non-existent and most residents therefore depend on hand dug wells or other water sources which cannot guarantee an acceptable level of quality.

3.3 Household's Access to Borehole Water Supply

Access to portable water has been described as a basic human right [7] and one of the most important preconditions for sustainable development [8]. A survey of household access to borehole water supply in Vandeikya L.G.A was undertaken based on the standard advanced by [6] as presented in table 1. The results of the survey depicted in table 4, reveals that 56.3% of the respondents have 'No Access' to borehole water supply; 31.7% of the respondents have 'Basic Access' to borehole water supply, 10.6% of the respondents have 'Intermediate Access', while 1.6% of respondents have 'Optimal Access' to borehole water supply.

Table 4. Household Access to Borehole Water Supply in Vandeikya L.G.A

Distance to borehole	Quantity of water collected	Avg. time spent	Level of access	F	%
More than 1000m	Below 5L/cap/day	> 30mins	No access	142	56.3
Btw 100- 1000m	Not more than 20L/cap/day	5-30mins	Basic access	80	31.7
Less than 100m	About 50L/cap/day and 100L/cap/day	5 mins	Intermediate access	26	10.3
Water point within household	above	< 5mins	Optimal access	4	1.6
Total				252	100

Source: Authors' fieldwork, 2019.

The results highlighted above has shown that more than half of the respondents do not have access to borehole water supply. What this means is that a large proportion of the population walk/trek over 500 meters and spending more than 30 minutes to fetch less than 5 liters of water per capita per day at an available borehole. This is a reflection of the watersupply situation across many rural areas in Nigeria as demonstrated by other research findings [9; 10; 11].

The 31.7% and 10.3% of the respondents representing those having Basic access (walking/trekking between 100-500 meters and spending between 5-30 minutes to fetch not more than 20L/cap/day) and Intermediate access (walking/trekking less than 100 meters and spending 5 minutes to fetch about 50L/cap/day) to borehole water supply respectively is a reflection of the little efforts Government and other Development Partners have made towards providing water for the people of Vandeikya. These statistics indicates that the water supply situation would have been much better if most of the boreholes and other water supply infrastructure were still in a good working condition. Findings by this research have shown that apart from the communities in Vandeikya Township and Ihugh, the other sampled communities on the average had only one functional borehole.

In most rural areas, particularly in the developing parts of the world, it is not common to find water points within the household. Most of the water supply points are located in places like markets, health centers and along road junctions. People have to walk some distance to fetch water. This explains why only 1.6% of the respondents have optimal access to borehole water supply.

3.4 Impact of Borehole Conditions on Access to Water in Vandeikya L.G.A

One of the major challenges facing the water sector remains the inequalities or disparities in people's access to portable water supply. These differences which are most noticeable over space, can be largely attributed to the availability of boreholes and their conditions. A survey of the spatial variation in households' access to borehole water supply was undertaken in twelve communities across Vandeikya L.G.A and the results is correlated with the functionality status of boreholes as shown in table 5 below.

The result show that over 60% of respondents in Tyakpo, Gbem, Tsar, and Mbashagba communities do not have access to borehole water supply. Specifically, the mean percentage of respondents without access to borehole water supply is 61.5%. These communities have the most severe water supply issues. Apart from Vandeikya Township (where Tyakpo community was sampled) which has four functional boreholes, other districts Tsambe and Nyumagbagh, where the other three communities were sampled each have only two functional boreholes.

In Yuhe and Ihugh Market Area (both are communities in Mbadede council ward), only about 42.9% and 47.6% respectively of the respondents do not have access to borehole water supply. Mbadede council ward has the highest number of functional boreholes (10). In addition to the government owned boreholes, this district has many boreholes that are privately owned. These boreholes have helped to complement water supply and therefore made the water access problem here less complicated compared to the communities mentioned above.

Table 5. Borehole conditions and Access to Water in Vandeikya L.G.A

Name of District	No. of boreholes Available	No. not functioning	Name of community	No. of Resp.	Level of access to borehole water supply						
					No access (%)	Basic access (%)	Intermediate access (%)	Optimum access (%)			
Township	13	9	Tyakpo	19	63.2	26.3	10.5	0			
			Hausa Qrts	22	59.1	31.8	9.1	0			
			Mbagbera	7	4	Tsua	22	54.5	31.8	13.6	0
			Mbatswam	21	57.1	33.3	9.5	0			
Tsambe	8	6	Gbem	23	60.9	26.1	13.0	0			
			Adeiyongu	22	54.4	36.4	9.1	0			
Mbajor	8	6	Tsegbamwuan	21	57.1	28.6	14.3	0			
			Mbakwaghkor	19	57.9	36.8	5.3	0			
Mbadede	27	17	Ihugh-Mrkt	21	42.9	38.1	18.2	0.8			
			Yuhe	21	47.6	28.6	23.0	0.8			
Nyumagbagh	8	6	Tsar	21	61.9	33.3	4.3	0			
			Mbashagba	20	60.0	30.0	10.0	0			
				252							

Source: Authors field work, 2019

In another perspective, the result show that the households around Ihugh market (in Mbadede district) had the highest percentage of respondents (38.1%) having Basic access to borehole water supply. This is closely followed by Mbakwaghkor (36.8%) and Adeiyongu (36.4%) communities. Other communities like Tsar and Mbatswam had 33.3% of respondents respectively having basic access to borehole water supply.

The results further show that Tsegbamwuan (28.6%), Yuhe (28.6%), Tyakpo (26.3%) and Gbem(26.1%) communities, had the lowest percentage of respondents with Basic access to borehole water supply. Incidentally, Tyakpo and Gbem communities happen to be among the four communities with the highest percentage of respondents without access to borehole water supply. These two communities (and by extension Vandeikya Township and Tsambe districts) therefore deserve special interventions in water supply infrastructure.

For Intermediate access, the results indicates a very low percentage of respondents with this level of access to borehole water supply. In Tsar, Mbakwaghkor, Adeiyongu, Mbatswam and Hausa Quarters communities, less than 10% of respondents have Intermediate access to borehole water supply. In Tyakpo, Tsua, Gbem, Tsegbamwuan, and Mbashagba, the percentage of respondents with Intermediate access to borehole water supply is still low, though a little higher (than the communities listed above), with an average respondent percentage of 12.3%. The reason for the situation discussed above is that most of the respondents in these communities have to cover some distance to get water from the few boreholes available.

In Yuhe and households around Ihugh market, the situation appears to be a little different as 23% and 18.2% of respondents respectively have Intermediate access to borehole water supply. These two communities

incidentally have the lowest percentage of respondents without access to borehole water supply, an indication that the relatively high number of boreholes in these communities has considerably reduced the distance and time people spend to get water.

For optimum access, the results show that besides Yuhe and Ihugh Market area, no respondent in any other community has this level of access to borehole water supply. However, the percentage of respondents in this category for the two communities is less than 1%. The implication is that less than 1% of the respondents have water points within their households. In rural areas, particularly in the developing parts of the world, it is not common to find water points connected within households. Most of the water supply points are located in places like markets, health centers and along road junctions. People have to walk some distance to fetch water.

IV. CONCLUSION AND RECOMMENDATIONS

This study has shown that there is a water supply problem in Vandeikya L.G.A and as a result, access to borehole water supply is still low in many communities. The perception among the people is that lack of water supply infrastructure and frequent failure of the available ones has drastically limited/hindered households' access to water. The study concludes that fixing the boreholes that have broken down across the L.G.A. will be key to promoting access to water.

Based on the findings of this research, it is recommended that:

1. The Benue State Government should increase budgetary allocation to ensure strategic provision of water facilities especially in communities like Tyakpo, Gbem, Tsar and Mbashagba that have been observed to have very serious water supply issues. This will increase access to water for the people consequently reducing the distance and time spent to look for water. This will also help reduce the number of people that depend on water facilities.
2. In order to check the frequent break down of boreholes observed across Vandeikya L.G.A, Government should involve the local communities in the planning, execution and management of water supply projects. Water committees should be formed and the members trained on how to handle or operate the boreholes. When this happens, the people see the projects as their own so they manage it better.

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