

Access to Pipe-Born Water Evaluation in Akwanga Local Government Area of Nasarawa State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Water is an essential element of the natural resource of the earth that sustains all living creatures on the planet, it's fundamental importance can never be overemphasized. This study evaluates access to pipe-born water in Akwanga Local Government Area, Nasarawa State. The study identifies the sources of household water supply and identifies the presence of pipelines facilities in each household, to determine if the quantity of pipe water supply meets demands, also assesses the effects of the quantity of water supply on the socioeconomic activity of householders. This study adopted a survey research design. A total of 300 questionnaires were administered to households. A purposive sampling technique was employed to select the respondents. Five wards were selected within the study area, while 60 copies of questionnaires were distributed in each of the selected wards. Data were analyzed and presented using a descriptive form of statistics. The study revealed that most of the pipelines meant for the supply of water were old and inefficient. Therefore, no significant coverage (60%) of pipeline facilities in the study area. Pipe-borne water supply in the study area is not sufficient to meet the demands of the residents due to irregularity in the flow of water; 4.2% of these taps run every day, 8.8% of these taps run once a week, 11.7% of these taps run once in 3 days, 18.4% of these taps run once a year, 22.2% of these run once a month, while

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37.7% water used for cooking, washing, drinking and sanitary purposes were mostly sourced from alternative sources that are energy and time consuming and costly to obtain. The average water consumed per person per day in the study area was 37.76 litres which are below the minimum absolute daily water needed 50 litres per person per day as stated by UNDP. Consequently, pipe-borne water supply in the study area does not have any significant impact on the socio-economic activities of residents as people still spent the better part of their time sourcing for water. This study, therefore, recommends that there should be constant monitoring of population growth rate and repairs of damaged pipes and taps in the study area.

Keywords: Pipe; water; distribution; households; and access.

1. INTRODUCTION

Water is a natural resource of fundamental importance, the reason being it supports all forms of life on earth and creates jobs and wealth in the water sector, tourism, recreation, and fisheries [1,2].

Globally, water covered 70% of the earth, and out of this proportion, only 1% is a source of drinking. Other domestically needed include bathing, cooking, and laundry [3-5].

More also, around the world, billions of people lack adequate access to one of the essential elements of life: clean water. Although governments and aid groups have helped many living in water-stressed regions gain access in recent years, the problem is projected to get worse with the harmful effects of global warming and population growth [4].

However, without water life, as it exists on our planet, is impossible [6,7]. About 97.5% of the water on the earth is salt water, leaving only 2.5% of freshwater of which over two-thirds is frozen in glaciers and polar ice caps. The remaining unfrozen freshwater is mainly found as groundwater; only a small fraction is present above the ground. Freshwater is a renewable resource, yet the world's supply of clean fresh water is steadily decreasing [8].

Water demand already exceeds supply in many parts of the world, and as the world population continues to rise at an unpredicted rate, many more areas are expected to experience this imbalance shortly [9].

Water scarcity is defined as the point at which the aggregate impact of all users impinges on the supply of water under a prevailing institutional arrangement to the extent that the demand by all sectors, including the environment cannot be satisfied fully [9]. Water scarcity is a relative

concept and can occur at any level of supply or demand. Scarcity may be a social construct (a product of affluence, expectations, and customary behaviour) or the consequence of altered supply patterns-steaming from climatic change for example [10].

The water scarcity situation is severe in developing countries with an estimate of about a 1.2billion people in developing countries without access to "to safe water" [11,10]. The World Commission for Water (2000) estimates that more than 1billion people in developing countries do not have access to clean water whilst 2billion people lack adequate sanitation. In the case of Sub-Saharan Africa, Rosen and Vincent [12] estimate that about 67% of the rural population (about a 250million people) lack a safe and accessible water supply whilst 81% do not have access to sanitation facilities. 20% of the urban population (322million people) do not have access to water supply whilst 37% lack access to sanitation facilities [13,14,10].

In Nigeria today, research indicates that the majority of the common freshwater sources are polluted, resulting in a series of outbreaks of these and other diseases. A study by [15] showed that 48% of the people in the Katsina-Ala Local Government Area of Benue state were affected by urinary schistosomiasis, due to an increase in water pollution. Some previous investigations indicate that 19% of the whole Nigerian population is affected, with some communities having up to 50% incidence of schistosomiasis. Also, Olaoye and Onilude [16] have documented varying levels of microbial contamination in drinking water from western parts of the country. In addition to microbial infections, heavy metals poisoning through drinking water have also been documented [17] reported blood lead levels greater than 30mg/dl in children from Kaduna state. [18] reported a mean arsenic concentration of 0.34mg/l in drinking water from hand-dug wells, boreholes,

and taps of Karaye local government area, Kano state.

Abaje et al., [19] revealed that there is a significant relationship between the sources of water supply and incidences of water-borne diseases. That is to say, inaccessibility to the pipe-borne water supply may be the major factor of the various water-borne diseases arising from contaminated water and poor sanitation practices. The health consequences of water scarcity include diarrhoea diseases such as cholera, typhoid fever, salmonellosis, other gastrointestinal viruses, and dysentery [10,20].

The scarcity of domestic water has resulted in high dependency on supplementary sources such as hand-dug wells, boreholes, water vendors. [19], observed that residents of Jamaa, in Kaduna state resorted to hand-dug wells, boreholes, water vendors, and even streams as a result of water scarcity. Those that bought water from water vendors complained of high costs of water especially in a large family that depends on water vendors [19].

Therefore, access to basic water supply services in both urban and rural areas is a current issue that is threatening the livelihood of people globally [10]. This study focuses on evaluating the access to pipe born water in Akwanga local government of Nasarawa State, Nigeria. aiming at examining the distribution of pipe-born water supply and sources of water across households, management practice and maintenance of the facilities resources as well the socio-economic impact in Akwanga local government area of Nasarawa state.

This study postulates a hypothesis that pipe-borne water supply has not impacted the socio-economic activities of people in the study area.

2. MATERIALS AND METHODS

The study area lies between latitude $8^{\circ} 5'$ to $9^{\circ} 00'$ and longitude $8^{\circ} 15'$ to $8^{\circ} 30'$ it is located in the Northern part of Nasarawa State. It shares boundaries with Sanga Local Government of Kaduna State in the North, Nasarawa Eggon Local Government in the South, Wamba Local Government in the East, and Kokona Local Government in the West respectively as shown in Fig. 1.

The climate exhibited in the area under study shows no difference from that experience over

the rest part of Nasarawa State, which is characterized by a sub-humid climate with two distinct seasons; dry and raining season [21]. Akwanga Local Government area has a population of 113430 persons according to National Population Commission Lafia [22]. The area falls within the guinea savanna zone characterized by scattered trees and grasses. The geology comprised of the basement complex formation of North Central Nigeria with undulating low lands and a network of hills developed on granites, magnetite rocks which are believed to be plutonic but later exposed to the surface by geomorphic processes.

The study area settlement is located at the lower foot of Jos plateau. The central and northern part is characterized by hills and rocky rising to over 600m (2000ft). Andaha hills, while eastern and southern parts of the study areas are dominated by undulating plains and outcrops, inselbergs scattered around the region eastern and northern strip [21].

A purposive sampling method was employed to select the respondents. Five wards were randomly selected out of the 12 wards. A total of 300 copies of the questionnaire were administered to the five wards randomly selected (60 in each ward). The sampled wards include Akwanga East, Akwanga South, Gwaje, Andaha and Ancho. This was sizeable enough to provide the required information needed in the study area. An open and closed questionnaire was structured to obtained information concerning access to pipe-borne water in the study area. A questionnaire was administered direct face-to-face interaction or interview to the respondents by the researcher and field assistants. A total of 282 questionnaires were duly filled and return by the respondents which were used for the analysis of the result. The responses from the answered questionnaire were coded. Descriptive statistics were used. This involved the use of frequency, percentages, and charts. A pattern that exists between two or more categorical variables was revealed by cross-tabulation. Source of the results data: Author's field work,2019.

3. RESULTS AND DISCUSSION

The results and discussion of the finding is presented inform of tables below:

As seen in Table 1, 39.7% of the households have taps, while 60.3% of the households do not

have taps. This, therefore, revealed that there is no significant coverage of pipe-borne facilities in the study area.

Table 1. Presence of pipe in households (access to tap water)

Responses	Frequency	Percentage
Yes	170	60.3
No	112	39.7
Total	282	100

Table 2. Frequency of tap flow in households

Responses	Frequency	Percentage
Every day	13	4.6
Once 2-3days	34	12.1
Once a week	24	8.5
Once a year	51	18.1
Once a month	63	22.3
Never	97	34.4
Total	282	100

Table 3. Distance to water sources

Responses	Frequency	Percentage
Water vendors,	30	10.6
Open well,	40	14.3
Borehole or trekking	212	75.1
Total	282	100

Table 4. Distance covered to get water

Responses	Frequency	Percentage
Less than 100m	182	70.3
Distance 101-200m	83	20.5
201-300m	17	9.2
Total	282	100

Table 5. Household members involved in water collection

Responses	Frequency	Percentage
Women	43	15.3
Men	25	8.8
Children	16	5.7
Women and children	198	70.2
Total	282	100

From Table 2, it can be seen that there is a downward trend in the flow of water from the taps: 4.6% of them run every day, 8.5% run once a week, 12.1% run once in 2-3days, 18.1% run

once a year, 22.3% of these taps run once a month, while 34.4% of these taps have never run as attested by the respondents.

The responses in Table 3 shows that householders had resorted to either buying water from water vendors, open well, borehole or trekking to distant neighbourhoods to fetch, as a result of irregular pipe-borne water supply. In the course of sourcing for alternative water supply, the majority 75.1% of the households had to trek, which of course involved household members while others get it from the water vendors, open well.

As shown in Table 4, majority 182(70.3%) of the household members trekked a distance less than 100m, 83(20.5%) of the household members trekked a distance between 101-200m, while only 17(9.2%) of the household members trekked a distance between 201-300m to have access to water in the study area.

From Table 5. Household members involved in water collection; majority 70.2% were women and children, women 15.3%, children 5.7% while 8.8% were men. The implies that women and children suffer much to get water for the households' members in the area.

3.1 Management Practices on the Pipe-Borne Water Distribution System by Water Board Officials

Issues as regards to maintenance culture of the pipe-borne water distribution system and the state of pipelines were discussed.

From Table 6, there was a downward trend in how frequently water board officials come to replace old pipelines with new ones. The table reveals that majority 207(73.4%) of the respondents indicated that water board officials never came to replace old pipelines with new ones, 58(20.6%) of the respondents indicated that water board officials hardly came to replace old pipelines with new ones, while 17(6.0%) of the respondents indicated that water board officials always come to replace old pipelines with new ones. This information was strongly supported by the response mode concerning how old pipeline distributions were. The table shows that 243(86.2%) of the respondents agreed that most of the pipeline systems distributing water were old, while 39(13.8%) of the respondents disagreed that most of the piping systems distributing water were old.

From Table 7, a majority (96.5%) of the household water for washing clothes in the study area were from the following sources open well 54.6%, borehole 35.5%, and water vendor 6.4% other than pipe-borne water 3.5%.

Table 6. State of a pipe-borne water distribution system

Variable		Frequency	Percentage
Water s Board officials come To Replace old pipelines With new ones	Always	17	6.0
	Not always	58	20.6
	Never	207	73.4
Total		282	100
Most of the piping Systems distributing of Water are old	Strongly agreed	145	51.4
	Agreed	98	34.8
	Disagreed	29	13.8
	Strongly disagreed	0	0
Total		282	100

Table 7. Sources of water supply in the study area

Responses	Frequency	Percentage
Open well	154	54.6
borehole	100	35.5
Water vendor	19	6.7
Pipe born water	9	3.2
Total	282	100

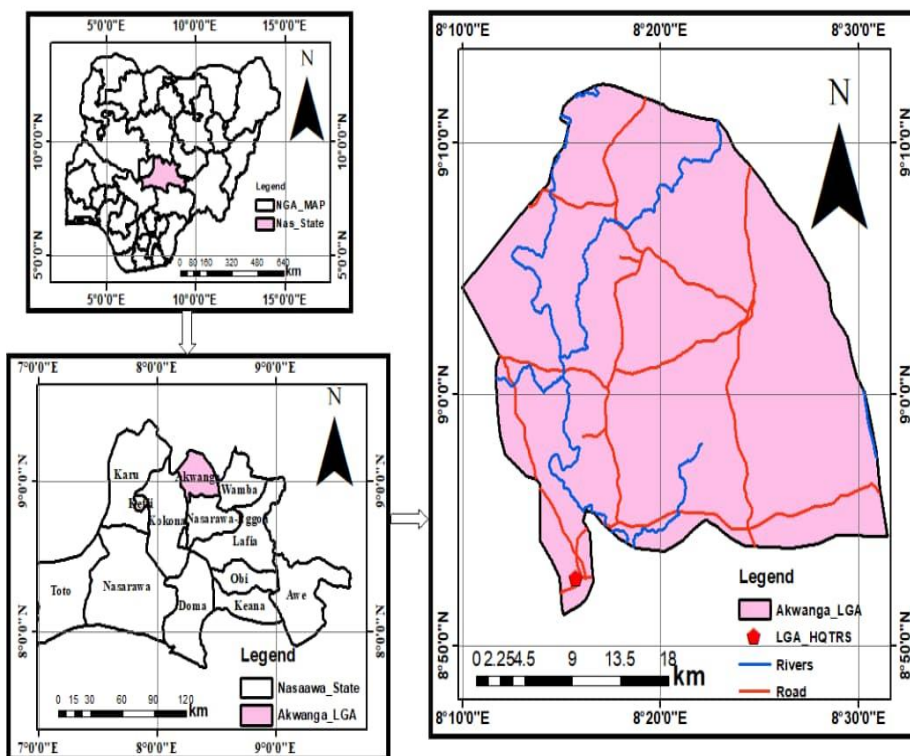


Fig. 1. Study area map

Sources: Geography Department Nasarawa State University, Keffi 2021

3.2 Water Storage Employed by Households

The table below shows various ways employed to store water and the reasons for water storage in Akwanga LGA

From Table 8, the majority 269(95.4%) of the respondents store water, while only 13(4.6%) of the respondents do not store water. Also, the reasons for storing water by the respondents were as follows: for the sustainability of the households when water is scarce, to save them from trekking every day in search of water, to save them from buying from water vendors, and to make water available whenever they want to use it.

3.3 Effects of Quantity of Water Supply on the Socioeconomic Activities

At the household level, the socioeconomic significance of water is achievable when it is proper and functioning pipe-borne water coverage and how it has impacted the time spent collecting water and as well reported cases of water-borne diseases in the study area. Under the null hypothesis that pipe-borne water supply has not impacted the socio-economic activities of the area.

Variables were, therefore, cross-tabulated to determine whether water supply significantly affects socio-economic activities. Variables such as the frequent flow of taps were cross-tabulated with costs associated as a result of the uneven coverage of functioning taps.

The result of 1 cells (10.0%) have an expected count of less than 5. The minimum expected count is 4.03.

Findings from chi-square revealed that at 5 degrees of freedom, the 95th percentile is 11.1 is greater than the calculated value (6.544). Therefore, the observed chi-square is not significant at 0.05 levels. So the null hypothesis is not rejected and we conclude that pipe-borne water supply has not impacted the socioeconomic activities of people in the study area. Implying that householders in the study area spent a greater amount of time sourcing for water by trekking some distances.

3.4 Discussion of Findings

Findings from (Table 1) of this study showed that there is no significant coverage of pipe-borne water distribution systems in the study area. However, the available ones are old, thus making most of the taps inefficient and inadequate for

Table 8. Water storage employed by households in the study area

Variables		Frequency	Percentage
No. of people have to Store water	Yes	269	95.4
	No	13	4.6
Total		269	100
Reasons for Storing water	To sustain us when there is scarcity of Water.	65	24.2
	To save us from Trekking every day. So that I will not have to buy from Vendors.	87	32.3
	To make water Available when ever I want to use it.	57	21.2
		60	23.3
Total		269	100
Method of storing Water	Inside drum	88	32.7
	Jerry can	93	34.6
	Buckets	49	18.2
	Plastic bowl	35	13.0
	Overhead tank	4	1.5
Total		282	100

Table 9a. Cross Tabulation of Pipe Borne Water Flow against Distance Trekged to Alternatively, Water Supply in the study area

			Do you trek to Source for water.			
			yes	no	Total	
Frequency of run water from taps	once in 2-3 Days	Count	27	1	28	
		Expected	22.6	5.4	28.0	
	once a week	Count	16	5	21	
		Expected	17.0	4.0	21.0	
	Never	Count	67	16	83	
		Expected	67.1	15.9	83.0	
	once a year	Count	32	12	44	
		Expected	35.5	8.5	44.0	
	once a month	Count	43	10	53	
		Expected	42.8	10.2	53.0	
	Total		Count	185	44	229
			Expected	185.0	44.0	229.0
		Count				

Table 9b. Chi Square test on whether or not pipe-borne water supply has impacted on the socio-economic activities of residents in Akwanga L.G.A

Chi-Square Tests of	Significance level		Asymp. Sig. (2-sided)
	Value	df	
Pearson Chi-Square	6.545 ^a	4	.162
Likelihood Ratio	8.148	4	.086
Linear-by-Linear Association	2.112	1	.146
N of Valid Cases	229		

water supply. This finding is therefore in agreement with the studies of Chikher [23] in the context of Algiers, Allan- El Mansouri [24] in Saleth, and Dinar, [25], and Darmame [26], which in their studies, affirmed that having a connection to the network is not always synonymous with adequate access to water in terms of quantity, quality, and regularity. Also, [27] World Commission for Water 2000; [28] estimates that more than 1billion people in developing countries do not have access to clean water whilst 2billion people lack adequate sanitation as a result of the irregular water supply, householders resorted to buying water from water vendors and trekking to some distance source of water supply such as open well and borehole (Table 7) corroborated with a study by [29]. This finding is supported by Akinola [30] who affirmed that when social infrastructure like municipal drinking water

distribution system functions below expectations, could make one pays in kind and cash. (2012). Findings from the study also showed that the quantity of pipe-borne water supply in the study area did not meet demand, implying that pipe-borne water is a scarce commodity in the study area (Tables 2, 6).

Another finding from (Table 9a and b) the study showed that pipe-borne water supplied in the study area has not impacted socioeconomic activities since household members spent a better part of their time collecting water. This finding is supported by (UNDP, 2006) [28,10] affirmed that in most developing countries, women and young girls often spend hours collecting and carrying water, restricting their opportunities in productive activities due to low pipe-borne water coverage (Tables 5, 4 and 6).

4. CONCLUSION AND RECOMMENDATIONS

In this study, most of the pipelines meant for the supply of potable water to these households are old and inefficient despite a significant coverage of the area. The inefficiency and poor functioning of these pipelines were a result of poor or no maintenance by the water board officials. The pipe-borne water supply in the study area is not sufficient to meet the demands of the residents due to irregularity in the flow of water. Water used for cooking, washing, drinking and sanitary purposes were mostly sourced from alternative sources which consume energy and time that could have been used in other productive aspects of the economy.

Based on the findings, the following recommendations were made; there should be constant repairs of damaged pipes and taps to reduce leakage in the study area, hence, Proper maintenance of equipment at the waterworks should always be carried out in the study area. More funds should be allocated to water resources development. More also, there should be public enlightenment campaign on mass media against the reckless overconsumption and misuse of water, as well there should be constant monitoring of the rate of population growth to enable the government to be able to plan in order not to face problems resulting from rapid urbanization for water sustainability.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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